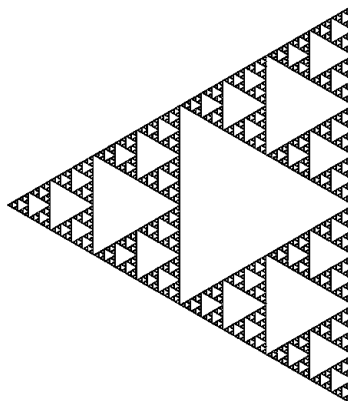


Rational Antitrust Analysis

An inquiry into antitrust assessment principles
and procedures

Dr. Philos. thesis



Peder Østbye
Oslo, January 2013

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*“Rationality is the ability and inclination to use
instrumental reasoning to get on in life.”
R. Posner*

Preface

This is a thesis handed in as a Dr. Philos thesis at University of Oslo. Dr. Philos is an unsupervised doctorate outside the conventional PhD program. It is a lonesome project to write a Dr. Philos thesis. You work years on a project with substantial uncertainty associated with success. My adjudication committee provided justified, constructive and extremely valuable critics on the first version of this thesis. The committee encouraged and challenged me to do a major revision of this first version for a second and last chance for the thesis to be adjudicated for Dr. Philos. I took the challenge and am truly thankful to the adjudication committee, Dr. Juris Anders Chr. Stray Ryssdal, Dr. Polit Tina Søreide, and Professor Morten Hviid.

As this is an unsupervised thesis, I have no supervisors to thank. I have, however, benefited from fruitful discussions with members of the Norwegian competition law society. This has to some extent filled the gap from lack of supervision. I have also been given the opportunity to present my ideas at several Norwegian academic institutions where I received valuable feedback. Especially valuable was a presentation at the Norwegian School of Economics administered by Professor Lars Sørgard, and a presentation at the department of Economics, University of Oslo, administered by Associate Professor Jo Thori Lind. I would like to direct a special thanks to Steinar Undrum, who was my manager at my former employer, Department of Competition Policy, Norwegian Ministry of Government Administration and Reform. Steinar is always accommodating for discussions and shares my keen interest in the application of economic principles in law. Steinar is by far the most experienced competition policy practitioner I have ever met, and will probably ever meet. I would also like to thank my former colleague, close friend, and excellent lawyer Olav Boge, who has always been willing to discuss my ideas. Olav has the property to always find a funny twist to our discussions.

I would like to thank my present employer, Simonsen Advokatfirma, for letting me use time to finish this thesis. I would also like to thank the administration at University of Oslo, especially Gro Tømmerek, for professional and smooth handling of the practical issues. I would also like to mention that I benefitted from good proofreading services at a reasonable price from totaleditors.com.

I dedicate this thesis to my parents, my wife, Assem, and my daughter, Karima, who reminds me that there are far more complex and beautiful things man can create than a doctoral thesis.

Peder Østbye
January, 2013

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1 Introduction

This thesis is a study into the rationality of antitrust analysis. Antitrust analysis consists of the determination and interpretation of antitrust rules and the assessment of evidence in the application of antitrust law. The main statutory antitrust laws are taken as given in this study. Thus, the focus of this study is the determination of rules and the assessment of evidence associated with deciding antitrust cases. The antitrust laws are the legal rules regulating actions that restrict competition between businesses in the market place. Broadly speaking, the antitrust laws cover cooperation between businesses that restricts the competitive pressure among them, practices that might exclude competitors from competing fiercely in the market place, and mergers and acquisitions that restrict competition.

From the perspective of rationality, this study aims to shed some light on the state of play after more than a century of intellectual debates on the proper interpretation of antitrust rules, how to assess different types of evidence in antitrust cases, and, in particular, the use of economic analysis as evidence in antitrust cases. Modern decision theory has established a standard that can be used to analytically assess the rationality of antitrust analysis. Thus, the standard used for assessing the rationality of antitrust analysis in this study is how antitrust analysis would have been performed by a rational decision maker following the principles of rationality established in modern decision theory.

This study is directed at antitrust analysis as such, independently of jurisdiction. However, for practical purposes, US federal antitrust law and EU competition law are used as a basis for the analysis. This is appropriate since, firstly, the two regimes are, at the time of writing, the two main antitrust jurisdictions in the world in terms of international research and scrutiny. Secondly, the two systems, although similar in many respects, are subject to both substantive and procedural differences that make them useful to illustrate key issues that are relevant for assessing the rationality of antitrust analysis. One such crucial difference is the adversarial nature associated with US antitrust law procedure and the inquisitorial nature associated with EU competition law procedure.

This study is devoted to three main research questions: *What is a rational antitrust analysis? Do the assessment principles and procedures applied in antitrust analysis facilitate rational antitrust decisions? How can the assessment principles and procedures applied in antitrust analysis be made more rational?* The assessment principles and procedures used in antitrust analysis are the subjects for this study. This means that the assessment of rationality

in antitrust analysis herein will focus on the ability of the assessment principles and procedures applied in antitrust analysis to yield rational decisions. The assessment principles applied in decision making cannot be scrutinized properly independently of the organization of the assessment procedure the decision making is performed within. For instance, if one operates with a factual presumption of anticompetitive effects in deciding an antitrust violation, the performance of this presumption is dependent on whether the decision procedure is designed such that this presumption actually becomes refuted when it should. A general analysis of the interdependencies between the assessment principles and the organization of the procedure in achieving rational antitrust decisions is the most important contribution to research that follows from this study. This study does not, however, seek to determine the rationality of all substantive antitrust rules and their associated decisions. That would be a far too ambitious task.

Research in law and economics has provided many seminal contributions on the application of decision theory in legal analysis in general and in antitrust analysis in particular. Thus, this study might most aptly be considered as a contribution to the field of law and economics, in particular to the law and economics of antitrust. However, this study raises general issues that might be of interest to researchers in law and legal reasoning in general, legal theory, and other areas of law, such as evidence law, who may not have any particular interest in law and economics or antitrust.

Chapter Two provides the reader with a basic introduction to the substantive antitrust laws and procedures in the US and EU. It is a descriptive chapter that is not meant to be a part of the research provided by this study. Chapter Two sets the stage for the research in the subsequent chapters by introducing terms and concepts crucial for this study. Furthermore, it will make this study self-contained in the sense that it will not be necessary to consult external antitrust law literature to understand the research in this study. Finally, a key purpose of Chapter Two is to highlight some key differences between US antitrust law and EU competition law. These differences will be crucial in discussing the rationality of antitrust analyses, and thus for the research in this study.

Chapter Three offers a more precise description of the various components of antitrust analysis and a basic framework for assessing the rationality of antitrust analysis. This framework will inform the remaining research in the study by contextualizing the research addressed in the subsequent chapters. In addition, this chapter also raises some independent research questions. The chief research questions of this chapter are: *What is a rational*

antitrust analysis? Can and should the principles of rationality guide antitrust analysis? The last question is essential in determining the value of proceeding with the study of rationality in antitrust analysis.

Chapter Four discusses rationality in the determination of the antitrust rules and how this coincides with how antitrust rules are actually determined. This is a natural starting point for the study of rationality in antitrust analysis because antitrust analysis starts with determining the relevant rule to apply to the fact in question. Chapter Four also discusses whether the principles of legal reasoning applied in antitrust and the antitrust procedural framework are likely to facilitate the production and evolution of rational antitrust rules. The chapter also indicates possible improvements that can be made in the antitrust assessment principles and decision procedures to promote the facilitation of rational rules. The chief research questions of this chapter are: *Are the current antitrust rules likely to be rational? Are we likely to observe an evolution towards rational antitrust rules? What can be done to promote more rational antitrust rules?*

Chapter Five addresses rationality in the assessment of antitrust evidence. It provides precise directions for a rational assessment of antitrust evidence, including the rational gathering of evidence. The rational assessment of antitrust evidence will be compared to how antitrust evidence is assessed according to the assessment principles and procedures actually used in evidence assessment. The chief research questions of this chapter are: *How should antitrust evidence be rationally assessed? Do the assessment principles and procedures in antitrust analysis promote rational evidence assessments?* The normative question of this chapter is: *How can the assessment principles and procedures used in antitrust analysis be improved to promote rational evidence assessments?*

Chapter Six addresses rationality in the assessment of economic models in antitrust analysis. This issue is covered in a separate chapter because the use of economic models in antitrust analysis is such a broad topic and raises so many issues that it deserves a separate discussion. Economic models are relevant as a theory in the determination of rational antitrust rules. However, in individual cases, the use of economic models and economic experts is of particular relevance in the assessment of evidence. A study of economics as such and a broad critical assessment of economic theory as a scientific discipline are beyond the scope of this study. Nevertheless, Chapter Six addresses the informative value of economic models in the rational assessment of such models in antitrust analysis. The first research question of this chapter is: *How should economic models be rationally assessed in antitrust analysis?* This

will set the stage and for the next research question: *Do the antitrust assessment principles and procedures applied in antitrust analysis facilitate a rational assessment of economic models?* This includes questions such as whether the most informative economic models will be brought to the table, and whether these models will be assessed according to their informative value. Chapter Six also addresses the normative question: *How can the rationality in the assessment of economic models in antitrust analysis be improved?*

Finally, Chapter Seven summarizes all the major conclusions following from this study.

The central aims of the thesis are to provide guidance on how rational antitrust analysis can be performed, how the assessment principles and procedures used in actual antitrust analysis are likely to correspond or diverge from a purely rational analysis, and how the assessment principles and procedures used in antitrust analysis may be improved to be performed more rationally. In addition to the intrinsic academic research value of such an assessment, this will be of value to antitrust decision makers by offering information about how to use rationality to support their analyses and decisions. This thesis also includes suggestions for improvements that are of interest to legislators and other policymakers. Furthermore, the thesis will be of value for antitrust practitioners who want to present arguments based on rationality. Indeed, argumentation based on rationality should be a virtue in legal argumentation, both regarding law and evidence assessment. The particular role of rationality in antitrust analysis is illustrated by a famous quote by one of the most influential antitrust scholars of the 20th century, Robert H. Bork: “*Antitrust policy cannot be made rational until we are able to give a firm answer to one question: What is the point of the law – what are its goals? Everything else follows from the answer we give.*”¹

Rationality is not the only means of presenting arguments in law. Unfortunately, this study may also provide ideas for practitioners who want to exploit irrationalities to achieve their goals in the application of antitrust law. A defense for this is that the study, hopefully, will contribute more to revealing and refuting irrational arguments than to their use.

¹ Bork (1978)

2 The antitrust legal framework

2.1 Introduction and motivation

This chapter offers a survey of antitrust law and procedure in the US and EU. This study is, however, not the place to give a comprehensive description of all the details of antitrust law and procedure. This can be met by the enormous and ever increasing body of literature covering the antitrust laws and procedures of the various jurisdictions.² This chapter will introduce terms and concepts crucial for this study. Furthermore, this chapter provides the reader with a sufficient antitrust law background to benefit from this study without the need to consult external antitrust law and procedure literature. A final purpose of this chapter is to highlight substantive and procedural issues that are of particular relevance for this study, including some key differences between US antitrust and EU competition law that are likely to influence the outcome of the antitrust analysis.

This chapter will start with a description of the substantive antitrust rules, and then proceed with the procedural aspects of antitrust with a primary attention given to issues related to evidence assessment.

2.2 The substantive antitrust rules

An introduction to a law should always introduce the reader to the purpose of the law as early as possible. Antitrust law is no exception. Before discussing the purpose of antitrust law, the rules will briefly be described on a surface level to provide the reader with some background when describing the purpose of antitrust. Then, in light of this discussion of the purpose of the law, a description of the main provisions in antitrust law follows.

2.2.1 Antitrust rules on the surface

In the US there are several acts that constitute the body of federal antitrust laws. The most famous of those are the Sherman Act of 1890 and the Clayton act of 1914. The Sherman Act Section 1³ prohibits anticompetitive conspiracies, while Section 2⁴ prohibits monopolization. The Clayton Act covers the prohibition of anticompetitive mergers and acquisitions in addition to the prohibition of some particular restrictions on competition.⁵ These rules are enforced by the Antitrust Division of the US Department of Justice. The Fair Trade

² Hovenkamp (2005) has been used as the primary guide to US Antitrust law and Whish (2009) as the primary guide to EU competition law. There is, however, excellent coverage of the topic from other authors.

³ 15 USC 1.

⁴ 15 USC 2.

⁵ The Clayton Act covers so-called interlocking directorates and bundling practices. Price discrimination was included in the Clayton Act with the amendments from the Robinson Patman Act of 1936.

Commission (FTC) was created with the FTC act of 1914. The FTC act gives the FTC the powers to intervene against unreasonable restraints of competition. In addition, the FTC has overlapping powers with the Antitrust Division to enforce the Clayton Act. In addition to the public enforcement there is a substantial private enforcement in US.

The EU competition rules are more recent than the original US antitrust laws. The US antitrust laws were an influential inspiration to EU competition law. The EU competition rules can be found in the Treaty on the Functioning of the European Union (TFEU).⁶ TFEU Article 101 prohibits anticompetitive cooperation between undertakings while TFEU Article 102 prohibits abuse of dominance by undertakings. Despite some differences, TFEU Articles 101 and 102 can be considered as parallels to the Sherman Act Sections 1 and 2. In addition to the prohibitions, the Merger regulation⁷ addresses mergers and acquisitions that restrict competition. The EU competition rules are enforced by the European Commission and the competition authorities of the member states with TFEU Article 103 as the legal basis. These provisions are supplemented by detailed regulations on enforcement and procedure. Council Regulation 1/2003⁸ contains for instance rules on the enforcement of TFEU Articles 101 and 102. In addition to this notices, guidelines and best practices are issued by the European Commission. Although the enforcement of the EU competition rules are mainly public, private enforcement is possible.

2.2.2 The purpose of antitrust law

There is a quite broad consensus among economists that the pursuit of efficiency should be the purpose of antitrust law.⁹ Competition facilitates a selection towards the most efficient and innovating firms. Furthermore, competition creates a pressure towards a price level that reflects marginal costs. As a result, the prices will serve as a signal of real economic costs, promoting efficiency in the use of resources in the society as a whole. The arguments for the link between competition and efficiency rely heavily on economic models. The use of models in antitrust analysis will be explored further in Chapter Six.

Competition is not a particularly suitable policy to obtain a desirable distribution of wealth if the purpose of distribution is to distribute from those with much wealth to those with

⁶ Consolidated versions of the Treaty on European Union and the Treaty on the Functioning of the European Union Official Journal C 115 of 9 May 2008.

⁷ Council Regulation (EC) No 139/2004 of 20 January 2004 on the control of concentrations between undertakings (the EC Merger Regulation) Official Journal L 24, 29.01.2004, p. 1-22.

⁸ Council Regulation (EC) No 1/2003 of 16 December 2002 on the implementation of the rules on competition laid down in Articles 81 and 82 of the Treaty Official Journal L 1, 04.01.2003, p.1-25.

⁹ See Hovenkamp (2005b), Chapters 1 and 2, for a discussion.

less wealth.¹⁰ On its face it might perhaps appear that competition is a suitable tool for such a distribution. Competition will reduce the profits obtained by presumably rich producers and promote lower prices for presumably less rich or even poor consumers. This reasoning is not always correct, though. First, lower prices through competition will benefit all consumers, rich and poor. Competition, as such, does not promote redistribution from rich to poor customers. The rich consumers will probably, in monetary terms, gain more from the lower prices as they buy more units and consume more. Furthermore, a rich person might be presumed to have a higher willingness to pay than a poor person. If a supplier in the absence of competition could price discriminate between the buyers, he would charge a high price to the rich and a low price to the poor. If competition eliminates this possibility, the customers who paid most before competition would gain most, which would be the richest persons. In addition, the presumption that the suppliers are rich while the customers are poor often fails to be correct. In the supply of maid services, it is, for instance, natural to assume that the suppliers of such services are quite poor, while the customers are quite rich. In the latter case, more competition, with resulting lower prices might result in redistribution from poor to rich.

Thus, antitrust laws are likely to be an imprecise policy instrument to promote a fair distribution of wealth. The economic argument for antitrust law would then be that competition should be used to promote efficiency to make the economic surplus as large as possible. The wealth from this surplus could be distributed fairly through other policies, such as tax policy. Some economists have argued that pursuing consumer interests by applying a consumer welfare standard¹¹ in the application of competition law might promote economic welfare better than using economic surplus itself as a standard due some systematic assessment failures.¹² The reasons are, among others, that consumers are more dispersed and less effective in advocating their interests. A consumer welfare standard might correct for this. Using a consumer welfare standard might also work better to obtain efficiency if the decision makers fail to consider the correct counterfactual situation when applying the competition law.¹³ However, it is probably safe to say that it is still not enough research and

¹⁰ See Farrell and Katz (2006).

¹¹ A consumer welfare standard means that for welfare to be considered improved then consumers must be better off.

¹² See Farrell and Katz (2006) for a survey of such arguments

¹³ An example of this is to assume that a firm might enter into one of two mutually exclusive profitable mergers that both increase economic welfare. The last merger increases economic welfare most in addition to increasing consumer welfare, while the first is detrimental to consumer welfare and most profitable. If this last merger is not used as a counterfactual when assessing the first merger it might be approved as it increases welfare compared to the status quo. By using a consumer welfare standard the first merger would be prohibited. This would create incentives to realize the second merger.

experiences to conclude that a consumer welfare standard promotes economic welfare better than using total economic surplus itself as the standard.¹⁴

Despite the economists' recommendations on what the purpose of antitrust law should be, this purpose must be derived from the sources that are relevant to interpreting laws according to the accepted methodology of determining and interpreting the law. The main principles of interpreting the law on the basis of the relevant legal sources are shared by most jurisdictions, although the relevance and weight of the different kinds of legal sources might vary from jurisdiction to jurisdiction.

In the US, there are no statutes that explicitly state the purpose of the antitrust laws. The main source to derive the purpose of law is to interpret the statutory text itself. The legislative intent and the history behind the law are also relevant. There is no unified consent on the legislative purpose of the federal US antitrust law. The US antitrust laws were, to some extent, a codification and criminalization of former common law rules that mainly had the purpose of preventing unreasonable trade practices. Some states already had antitrust legislation before the arrival of federal laws. However, the codification and criminalization at the federal level which came with the Sherman Act in 1890, has a history that can shed light on the purpose of the US antitrust laws. The high prices and market power due to cartels and monopolies, such as the powerful railway cartels at that time, is pointed to as one explanation. Small businesses' fear of big and potentially more efficient business is another explanation.¹⁵ The first explanation is compatible with an efficiency explanation of the antitrust laws, while the protection of small businesses from competition from bigger more efficient firms might be detrimental to efficiency and economic welfare, and can be better explained as a result of interest group influence. The two purposes are contradictory. While protection from higher prices from cartels benefits consumers, the protection of inefficient firms might lead to higher prices detrimental to customers. Thus, a law that serves both those objectives at once is not possible.

An important legal source in addition to the statutes themselves is the case law developed by the Supreme Court. Due to the relatively wide imprecise drafting of the statutory antitrust laws in the US, the courts have had broad discretion over the more specific details of the antitrust rules. In this task, it would be difficult for the courts to not say anything about the purpose of the antitrust laws. The US Supreme Court has, on several occasions,

¹⁴ This opinion is shared by Farell and Katz (2006), but that opinion is naturally based on the research available in 2006.

¹⁵ See Hovenkamp (2005) p. 48 f.

expressed its views on the purpose of the antitrust laws. A well-known statement that does not come directly from the Supreme Court, but which is approved by the Supreme Court, is the statement of Judge Learned Hand of The Federal Appeal Court (2. Cir) in the *Alcoa* case.¹⁶ Here, Judge Learned Hand stated that the main purpose of the antitrust laws was to promote competition with economic efficiency as secondary purpose.¹⁷ In *Brown Shoe*¹⁸ from 1962, the court clearly distinguished between the protection of competition and the protection of the competitors. The antitrust laws' job is to protect competition and not competitors. Thus, any eventual legislative intent for the antitrust law to protect small competitors as a purpose in itself was rejected by the Court in *Brown Shoe*. In *GTE Sylvania*¹⁹ from 1977, the Supreme Court stated that the purpose of antitrust laws is to maximize consumer welfare. It is not fully clear whether the maximization of consumer welfare simply means maximization of economic welfare or if this also implies some distributional purpose of antitrust. Maximization of consumer welfare in *GTE Sylvania* might be interpreted as the maximization of total economic welfare.²⁰ The improvement of consumer welfare can be considered as necessary for economic welfare to increase. Even it is possible to imagine that there is a tradeoff between overall economic welfare and consumer welfare in some static economic models, this might be more difficult to imagine in a dynamic perspective. The issue is not resolved by the various court decisions after *GTE Sylvania*, although some of them might be interpreted as if consumer welfare is something else distinct from total economic welfare.²¹

The EU competition rules can be found in the TFEU with a basis in the EU-treaty.²² The TFEU and EU-treaty are international treaties and must be interpreted in that context. This means that the competition provisions in the TFEU, in principle, should be interpreted according to the principles of international law. However, the EU-system is so unique that it is sometimes considered a system of law separate from both national law and international law. The Vienna Convention²³, Article 31, governs the methodology of law used by the ICJ²⁴.

¹⁶ U.S. v. Aluminum Co. of America, 148 F.2d. 416 (2.cir) (1945).

¹⁷ See Hylton (2003) p. 189 f.

¹⁸ *Brown Shoe Co. v. United States*, 370 U.S. 294 (1962).

¹⁹ *Continental T.V. Inc v. GTE Sylvania Inc.*, 433 U.S. 36 (1977).

²⁰ See Orbach (2011), Hovenkamp (2005) p. 7 and Hylton (2003) p. 40 f.

²¹ The purpose of the US antitrust law is however still briskly debated. There are different opinions, and there are various interpretations of what is meant by consumer welfare, see Orbach (2011) and Hovenkamp (2005) § 2.3. Some have interpreted the US Horizontal Merger Guidelines to adhere to a so-called consumer welfare standard in the application of the law, see Whinston (2006). As we will be discussed below, one should be careful to give determining weight to enforcement guidelines as enforcement authorities might be subject to bias towards avoiding type-2 errors. The US Horizontal Merger Guidelines are described further below.

²² Consolidated versions of the Treaty on European Union and the Treaty on the Functioning of the European Union Official Journal C 115 of 9 May 2008.

²³ Vienna Convention on the Law of Treaties of 23 May 1969. Entered into force 27. January 1980.

Article 31 is usually considered as the basis for the interpretation of international treaties, including the EU-treaty and TFEU. Parties in an international treaty can agree upon a methodology to interpret the treaty. However, this is not done for the EU-treaty and TFEU. Thus, the Vienna Convention can be used as a starting point in the interpretation of the EU-treaty and TFEU.²⁵ The Vienna Convention, Article 32, Paragraph 1 states that

A treaty shall be interpreted in good faith in accordance with the ordinary meaning to be given to the terms of the treaty in their context and in the light of its object and purpose.

It follows from Paragraph 2 that preambles and annexes are included in the context. In the preamble of the EU-treaty, it is stated that the parties to the agreement are

determined to promote economic and social progress for their peoples, taking into account the principle of sustainable development and within the context of the accomplishment of the internal market and of reinforced cohesion and environmental protection, and to implement policies ensuring that advances in economic integration are accompanied by parallel progress in other fields.

The purpose of the EU competition rules must also be seen in the context of article 3 of the EU-treaty, which, in Paragraph 1, states that “*The Union's aim is to promote peace, its values and the well-being of its peoples*”, and, in Paragraph 2 states that

The Union shall establish an internal market. It shall work for the sustainable development of Europe based on balanced economic growth and price stability, a highly competitive social market economy, aiming at full employment and social progress, and a high level of protection and improvement of the quality of the environment. It shall promote scientific and technological advance.

Thus, the EU competition rules are intended as a tool to promote growth, wealth and stability for EU citizens, economic integration and a competitive economy. It is stated in Protocol 27 to the treaty and TFEU that the internal market set out in Article 3 includes a system ensuring that competition is not distorted.

The history of the treaty is also important to interpret the purpose of the treaty. It is especially important for the EU-treaty and TFEU because the present treaties have evolved from previous treaties. The present EU-treaty unifies the former EC-treaty and the former EU-

²⁴ International Court of Justice.

²⁵ Arnesen (1995) p. 24.

treaty of 1992, also called the Maastricht treaty. The EC-treaty regulated the economic cooperation and can be traced back to the Coal and Steel Union, which was the predecessor to the EC. The cooperation on coal and steel was extended to the first EC-treaty of 1957, also known as the treaty of Rome. TFEU Articles 101 and 102 were numbered as Article 85 and 86, respectively, in the Rome treaty. Articles 85 and 86 of the Rome treaty were renumbered as Articles 81 and 82, respectively, in the Amsterdam treaty of 1997, and kept these numbers in the Nice treaty of 2001. The EC treaty was the economic pillar of EU cooperation, while the Maastricht treaty regulated the cooperation on foreign affairs and security policy. All of the cooperation is now merged into the present EU-treaty and TFEU. The competition rules, however, have their base in the EC-treaty and the application of the competition provisions dates back to 1957. Thus, events back to at least 1957 are relevant for assessing the purpose of the EU Competition rules.

The EU-treaty and TFEU are more extensive than most international treaties. The treaty gives the EU bodies legislative powers, gives the European Commission enforcement powers, and gives the European Courts judicial powers to resolve disputes between the European Commission and the countries, between the European Commission and private parties, and between member states.²⁶ It follows from the Vienna Convention Article 32, Paragraph 3, that subsequent practice shall be taken into account as context in the interpretation of the treaty. This means that the practice of EU bodies, and in particular, decisions of the European Courts are relevant in the interpretation of the EU-treaty and TFEU, including the competition provisions and their purpose. Regarding the purpose of the competition rules the ECJ stated in *Metro I*²⁷ that

the requirement contained in articles 3 and 85 of the EEC treaty that competition shall not be distorted implies the existence on the market of workable competition, that is to say the degree of competition necessary to ensure the observance of the basic requirements and the attainment of the objectives of the treaty, in particular the creation of a single market achieving conditions similar to those of a domestic market.

In the annual report of 2002, the European Commission stated that the purpose of EU competition policy is to “*to bring the benefits of effective competition to the consumer and at*

²⁶ In addition the court can provide preliminary rulings concerning, inter alia, the interpretation of the EU-treaties when such issues are to be assessed in national courts, cf. TFEU Article 267.

²⁷ *Metro SB-Großmarkte GmbH, & Co KG v Commission* Case 26/76 ECJ [1977].

*the same time to enhance the competitiveness of European industry.”*²⁸ Thus, it follows that promoting competition is a tool to promote welfare, especially consumer welfare, in accordance with the purpose of the treaty. However, a recent statement in *GlaxoSmithKline*²⁹ seems to have confused this issue a little. Here, the ECJ stated that TFEU, Article 101, “*aims to protect not only the interest of competitors or of consumers, but also the structure of the market, and in so doing, competition as such*”. The purpose of protecting competition and consumers is clear and uncontroversial, but is it a purpose to protect competitors as such? This would not always benefit consumers and increase economic welfare as described above. The solution to this dilemma is not clear at the time of writing.

The protection of consumers has a special role in the application of EU competition law. The role of consumers is implemented in the text of TFEU Article 101. It follows from paragraph 3 of TFEU Article 101 that, for a condition for an anticompetitive cooperation covered by the first paragraph to be legal on efficiency grounds, the consumers must be allowed a fair share of the benefits. This last requirement is the application of a consumer welfare standard, which means that not only must economic welfare be improved, but, in addition, consumers cannot be worse off. The same standard is assumed to apply in the application of TFEU Article 102 and in the merger control.³⁰ A debated question is whether consumer welfare is the purpose of the EU competition rules. It seems likely that the purpose of the EU competition rules is to achieve the superior goal of the treaty, which is, among others, economic welfare and competitiveness and protection of consumer interests. It cannot be deduced from the consumer welfare standard in the application of law that consumer welfare has to be the single purpose of the law. As discussed above, pursuing consumer welfare in the application of the law might be considered as a better way to pursue other goals such as economic welfare.

2.2.3 Prohibition of anticompetitive cooperation

Sherman Act, Section 1 states that

Every contract, combination in the form of trust or otherwise, or conspiracy, in restraint of trade or commerce among the several States, or with foreign nations, is declared to be illegal.

²⁸ XXXIIInd Report on Competition Policy, SEC(2003) 467, final para. 2, www.europa.eu.int/comm/competition/annual_reports/2002/en.pdf.

²⁹ *GlaxoSmithKline Services Unlimited v Commission* Case C-501/06 etc. ECJ [2010].

³⁰ See Whish (2009). However, it will be difficult to apply this standard if the competition rules have a partial purpose to protect competitors as such.

The text itself is quite imprecise and the potential scope of agreements and cooperation types that are covered is quite wide. On its face all agreements regarding trade can be interpreted to be covered by the prohibition. As soon as an agreement between, for instance, buyer and seller is legally binding, this is an obstacle to making a similar agreement with somebody else. This was clearly not the intention behind Sherman Act, Section 1, and it is not interpreted in this way. Thus, it is up to the courts to interpret and assess what is covered by Section 1. The division of practices that are prohibited per se and those practices that are prohibited as a rule of reason evolved early in the application of the law in the courts. The US guidelines on cooperation between competitors³¹ (horizontal cooperation) states, in Section 3.2, that

Agreements of a type that always or almost always tends to raise price or to reduce output are per se illegal. The Agencies challenge such agreements, once identified, as per se illegal. Types of agreements that have been held per se illegal include agreements among competitors to fix prices or output, rig bids, or share or divide markets by allocating customers, suppliers, territories, or lines of commerce.

Thus, conduct with a great potential of harm to competition is prohibited per se. No actual anticompetitive effects need to be proved. This will typically apply to price fixing between competitors and agreements where competitors divide markets between them to avoid competition. These are examples of hardcore cartels. For an action that is prohibited according to a rule of reason, actual harm must be proven, which means that the negative effects on competition must be proven to be sufficiently likely. Agreements between competitors that are not in the category of hardcore cartels will be scrutinized according to the rule of reason standard. The same applies to agreements between entities that are not competitors, but still potentially might harm competition, such as restrictions imposed on contract parties in the vertical chain (vertical agreements). A typical vertical agreement is an exclusivity agreement where some seller is given the right to exclusively sell a product.

That an action that is prohibited per se means, in principle, that the action is prohibited with no further inquiry. However, in recent practice, the distinction between per se violations and rule of reason violations has blurred.³² It appears to always be possible to argue that some conduct is outside the per se prohibition due to efficiencies in the specific case. On the other

³¹Antitrust Guidelines for Collaborations among Competitors issued by Federal Trade Commission and US Department of Justice (04/2000).

³²Elhaug and Geradin (2007) p. 57. See also, Gavil (2008).

hand, the scope of a rule of reason inquiry is dependent on the conduct in question. Sometimes it is enough with a “structured rule of reason”, which also known as “truncated rule of reason” and a “quick look approach” to establish a presumption of anticompetitive effects.³³ The scope of the inquiry into the actual circumstances depends on the general confidence in the anticompetitive effects of the conduct. Thus, the separation between per se and rule of reason has evolved into a more sliding scale of presumption rules, reducing the importance of placing some conduct in the per se or rule of reason category. This will be discussed this in more detail in Chapter Four.

TFEU, Article 101, Paragraph 1 states that

The following shall be prohibited as incompatible with the internal market: all agreements between undertakings, decisions by associations of undertakings and concerted practices which may affect trade between Member States and which have as their object or effect the prevention, restriction or distortion of competition within the internal market.

As with Sherman Act section 1 the text itself is quite broad. It covers both horizontal and vertical agreements. A non-exhaustive list of types of cooperation that might restrict competition is included in TFEU Article 101. Instead of distinguishing between per se prohibitions and rule of reason prohibitions, TFEU Article 101, distinguishes between those types of cooperation that restrict competition by object and those that restrict competition by effect. The European Commission’s guidelines on the application of TFEU 101 (3),³⁴ Section 21, states that

Restrictions of competition by object are those that by their very nature have the potential of restricting competition. These are restrictions which in light of the objectives pursued by the Community competition rules have such a high potential of negative effects on competition that it is unnecessary for the purposes of applying Article 81(1) to demonstrate any actual effects on the market. This presumption is based on the serious nature of the restriction and on experience showing that restrictions of competition by object are likely to produce negative effects on the market and to jeopardise the objectives pursued by the Community competition rules.

For a cooperation to restrict competition by object, it is thus not required that the parties to an agreement have some intent to restrict competition. Those who restrict competition by object

³³ See Gavil (2008).

³⁴ Communication from the Commission - Notice - Guidelines on the application of Article 81(3) of the Treaty Official Journal C 101, 27.04.2004, p. 97-118.

are those who have so high a potential of negative effects on competition that it is not necessary to demonstrate actual effects. This will typically be the hardcore cartels mentioned above. A restriction by object in TFEU, Article 101, is a factual presumption. TFEU, Article 101, Paragraph 3 states that cooperation covered by Paragraph 1 is not prohibited if it is necessary to create efficiency and consumer gains, and does not substantially eliminate competition. Even for those types of cooperation that restrict competition by object, relevant gains are an available defense. The European Commission has issued guidelines on the assessment of both horizontal agreements³⁵ and vertical agreements.³⁶

Conduct considered to restrict competition by object has strong parallels to restrictions considered per se illegal in US antitrust law. With the evolution of per se rules into presumption rules, the assessment principle is the same. However, this does not mean that the presumption rules are identical in the two systems. This will be further addressed in Chapter Four.

2.2.4 Prohibition of abuse of dominance

US Sherman Act, Section 2, states that

Every person who shall monopolize, or attempt to monopolize, or combine or conspire with any other person or persons, to monopolize any part of the trade or commerce among the several States, or with foreign nations, shall be deemed guilty[...].

As for Sherman Act, Section 1, the provision is broad. A finding of illegal monopolization normally requires qualified market power (monopoly power).³⁷ Illegal monopolization covers exclusionary behavior that must be distinguished from competition on the merits. In other words, illegal monopolization is about

*willful acquisition or maintenance of that power as distinguished from growth or development as a consequence of a superior product, business acumen, or historic accident.*³⁸

³⁵ Communication from the Commission - Guidelines on the applicability of Article 101 of the Treaty on the Functioning of the European Union to horizontal co-operation agreements Official Journal C11, 14.1.2011, p. 1.

³⁶ Commission Regulation 330/2010 of 20 April 2010 on the application of Article 101(3) of the Treaty on the Functioning of the European Union to categories of vertical agreements and concerted practices. Official Journal L 102, 23.4.2010, p.1-7.

³⁷ Elhauge and Geradin (2007) p. 227.

³⁸ United States v. Grinnel Corp, 384 US 563, 570-71 (1966). See also Elhauge and Geradin (2007) p. 227.

Sherman Act, Section 2, also explicitly includes attempted monopolization. A finding of attempted monopolization does not require the same level of monopoly power. It is, however, required that the alleged person has engaged in anticompetitive conduct with a specific intent to monopolize and with a dangerous probability of achieving monopoly power.³⁹ Thus, in the US it is possible to be convicted for an unsuccessful attempt to monopolize as long as success was sufficiently likely. In addition to the broad provision in Sherman Act section 2, the Clayton Act provides some more specific prohibitions on assumed anticompetitive behavior. With the amendment in Robinson Patman Act, Clayton Act got a specific provision addressing price discrimination.⁴⁰ To scrutinize further what monopoly power is, and the specific behavior that might constitute monopolization, the corresponding provision in EU should be discussed first.

TFEU, Article 102, states that

Any abuse by one or more undertakings of a dominant position within the internal market or in a substantial part of it shall be prohibited as incompatible with the internal market in so far as it may affect trade between Member States.

This means, briefly, that the abuse of a dominant position is illegal. It is not illegal to possess a dominant position, but the abuse of that position is illegal. An undertaking might possess a dominant position alone (single dominance) or together with other undertakings (collective dominance). The European Court of Justice used the following test to determine dominant position in *United Brands* by stating that a dominant position

*relates to a position of economic strength enjoyed by an undertaking which enables it to prevent effective competition being maintained on the relevant market by affording the power to behave to an appreciable extent independently of its competitors, customers and ultimately of its consumers.*⁴¹

Thus, the question of dominant position is a question of whether an undertaking can act independent of competitors, customers, and consumers. The question of collective dominance is a question of whether the undertakings have opportunity and incentive to behave as a single undertaking with dominant position. This usually requires economic analysis.

³⁹ *Spectrum Sports v. McQuillan* 506 US 445, 456,459 (1993). See Elhauge and Geradin (2007) p. 228.

⁴⁰ 15 USC § 13(a).

⁴¹ *United Brands v. Commission* Case 27/76 [1978].

The assessment of dominant position is similar to the assessment of monopoly power under US antitrust law. In both sets of rules market shares have traditionally served as factual presumptions, where market shares of more than 50 percent are considered as a presumption of dominance and monopoly power. Economic analysis such as the assessment of entry barriers, competitors' ability to react on price changes, buyer power, and other characteristics of the market in question might refute the presumption derived from market shares. A difference between US antitrust law and EU competition law is, however, the explicit regulation of attempted monopolization in the US. Conviction of attempted monopolization does not require monopoly power, as described above.

A general and abstract answer to what actions constitute abuse in EU competition law or what is monopolizing conduct under US antitrust law is almost considered as a holy grail by antitrust experts.⁴² As described above the, US test of monopolization is

*willful acquisition or maintenance of that power as distinguished from growth or development as a consequence of a superior product, business acumen, or historic accident.*⁴³

In *Hoffmann-La Roche*, the European Court of Justice stated on abuse that

*the concept of abuse is an objective concept relating to the behaviour of an undertaking in a dominant position which is such as to influence the structure of a market where, as a result of the very presence of the undertaking in question, the degree of competition is weakened and which, through recourse to methods different from those which condition normal competition in products or services on the basis of the transactions of commercial operators, has the effect of hindering the maintenance of the degree of competition still existing in the market or the growth of that competition.*⁴⁴

The challenge on both sides of the Atlantic is to distinguish between normal competition and anticompetitive behavior. Thus, competition on the merits must be separated from anticompetitive behavior. Several theorists have tried to develop general tests based on economic theory that separate competition on the merits and anticompetitive behavior.⁴⁵ TFEU, Article 102, provides some non-exhaustive examples of which conduct can constitute an abuse such as bundling and price discrimination. This can be compared to the special provisions in the US Clayton Act. However, first and foremost, it is court precedence that

⁴² See Whish (2009) p. 193 f.

⁴³ *United States v. Grinnel Corp.*, 384 US 563, 570 -71 (1966).

⁴⁴ *Hoffmann-La Roche & Co. AG v Commission of the European Communities* Case 85/76 [1979].

⁴⁵ See OECD (2005) and Østbye (2008) p. 99 f.

determines the content of abusive conduct in the EU, and correspondingly monopolizing behavior in the US. Conduct that has typically been under scrutiny are foreclosing rebates, predatory pricing (low prices to squeeze out competitors), price discrimination, refusal to deal, and various restrictions imposed on contracting partners such as exclusivity. The European Commission has provided enforcement guidelines on TFEU, Article 102.⁴⁶ Similar guidelines are not in force in the US. The guidelines that were developed under the Bush-administration were withdrawn by the Obama-administration.⁴⁷

A question that has been raised, especially in the EU, is whether there is some conduct that is considered per se illegal as abuse of dominance. This means in other words whether there are some actions that are considered as abuse of dominance without the need for any analysis of effects. In the US, this topic has not got the same attention as the per se violations are isolated to the hard core cartels. Whish (2009) points out that some court decisions can be interpreted to establish the existence of per se violations of TFEU, Article 102.⁴⁸ Some rebate schemes might, for instance, be considered to be a per se violation when they are offered by dominant firms. It appears, however, more likely that there are no per se violations of TFEU article 102, though some conduct is subject to a strong presumption of illegality.⁴⁹ A well-known example is that dominant firms' pricing below average variable costs is presumed illegal. Parties can always argue that their behavior is efficient and benefits consumers or that there are other objective justifications for their behavior.

As described above, the EU prohibition of abuse of dominance and the US prohibition on monopolization have strong similarities. However, there are important differences. One important difference is that TFEU, Article 102 covers so-called exploitative abuse, and not only anticompetitive behavior. Exploitative abuse involves the direct exploitation of market power such as charging supra-competitive prices and suppressing innovation. Exploitative abuses are included in the examples of abuse given in TFEU Article 102. Though exploitative abuses are covered by TFEU Article 102, actual decisions concerning such abuses are scarce.⁵⁰ When it comes to the regulation of monopoly prices, this is normally better addressed by economic sector regulations tailored to those sectors vulnerable to such abuses,

⁴⁶ Communication from the Commission — Guidance on the Commission's enforcement priorities in applying Article 82 of the EC Treaty to abusive exclusionary conduct by dominant undertakings OJ C 45, 24.2.2009, p. 7–20.

⁴⁷ Press release of May 9, 2009, http://www.justice.gov/atr/public/press_releases/2009/245710.htm.

⁴⁸ Centre belge d'études de marché - Télémarcheting (CBEM) v SA Compagnie luxembourgeoise de télédiffusion (CLT) and Information publicité Benelux (IPB). Case 311/84 ECR [1985] 3261. See also Whish (2009) p. 190 f.

⁴⁹ See Bailey (2010) for the same point of view.

⁵⁰ Whish (2009) p. 199 f.

which are sectors characterized by natural monopoly. For instance, sector regulations are in place in the telecom markets and electricity transmission markets.

Another difference between the EU prohibition on abuse of dominance and the US prohibition on monopolization is, as explained above, the explicit coverage of attempted monopolization in US law. As mentioned above, the requirement of monopoly power is not necessary for conviction for attempted monopolization. Furthermore, one can be convicted for unsuccessful monopolization as long as the intent was present and there was a dangerous probability of success. In EU law, dominant position must always be established, and either actual harm to competition or capability of harm to competition must be proved. Unsuccessful attempts are not covered. However, attempts might be included in the various member states' systems of sanctions. An attempt to act in violation of TFEU, Article 102, can be made a separate offence in national law.

Even if the coverage of attempted monopolization is included in US law on the contrary to EU law, the barrier to apply the monopolization provision seems higher in the US. This might partially be a question of enforcement priorities in addition to a question of law. The public interest in enforcing Sherman Act, Section 2, seems less in the US than enforcing TFEU, Article 102, in the EU, at least in recent decades. This is, however, dependent on the political regimes.⁵¹

2.2.5 Regulation of mergers and other concentrations

The US Clayton Act, Section 7,⁵² states that

No person [...] shall acquire, directly or indirectly, the whole or any part of the stock or other share capital ... where in any line of commerce or in any activity affecting commerce in any section of the country, the effect of such acquisition may be substantially to lessen competition, or to tend to create a monopoly.

The most practical condition for a merger to be prohibited is that it substantially lessens competition. This is the so-called SLC-test. The prohibition covers mergers, acquisition and some other concentrations with the same effects, which will all be referred to as mergers in this study. The prohibition covers both horizontal and vertical mergers, and the authorities have issued guidelines both on the handling of horizontal mergers⁵³ and on the handling of

⁵¹ In a press release of 11. May, 2009, Assistant Attorney General Christine A. Varney expresses a more hostile practice toward monopolization practices, cf. http://www.justice.gov/atr/public/press_releases/2009/245710.htm.

⁵² 15 USC 18.

⁵³ Horizontal Merger Guidelines (August 19, 2010).

non-horizontal mergers.⁵⁴ The enforcement of horizontal mergers has traditionally had a much higher priority than the enforcement of non-horizontal mergers.

As a starting point it is in principle no requirement for the acquisition of control for a merger to be covered by the prohibition. However, Clayton Act, Section 7, states that

[t]his section shall not apply to persons purchasing such stock solely for investment and not using the same by voting or otherwise to bring about, or in attempting to bring about, the substantial lessening of competition.

Acquisitions for pure investment purposes that are not an attempt to substantially lessen competition are, therefore, not in violation of Clayton Act, Section 7. For the acquisition of minority shares, it must therefore be proved that the acquisition is not just a pure investment, but leads to a substantial lessening of competition.

A regulatory framework specifically targeted at controlling mergers, acquisitions and other concentrations was originally not a part of the EU Competition law,⁵⁵ but was left to the national jurisdictions of the member states. This was a serious drawback for the community-wide control with restraints on competition. After a long political process, the first EU merger regulation entered into force with Regulation 4046/1989, amended in 1997 with regulation 1310/97.⁵⁶ The merger regulation framework was substantially revised leading to the present merger regulation (EMR) that entered into force May 1, 2004.⁵⁷ The EMR is based on a separation of jurisdiction between the European Commission and the member states. The jurisdiction of the European Commission is, as a starting point, restricted to mergers with a community dimension, which are mergers with sufficient cross border effects. The community dimension is, inter alia, reflected by thresholds based on the turnover of the merging parties and cross-border turnover, cf. EMR, Section 1. For these mergers, the European Commission has, as a starting point, exclusive jurisdiction.

The EMR is restricted to mergers leading to changes in control on a non-transitory basis. This is the control criterion and is a difference to the US counterpart. The EMR, Article 2, Paragraph 3 states that

⁵⁴ Non-Horizontal Merger Guidelines (06/14/1984).

⁵⁵ Some mergers were challenged according to the prohibitions, though.

⁵⁶ OJ [1997] L 180/1.

⁵⁷ Council Regulation (EC) No 139/2004 of 20 January 2004 on the control of concentrations between undertakings (the EC Merger Regulation) Official Journal L 24, 29.01.2004, p. 1-22.

A concentration which would significantly impede effective competition, in the common market or in a substantial part of it, in particular as a result of the creation or strengthening of a dominant position, shall be declared incompatible with the common market.

The condition for a merger to be incompatible with the common market is that the merger significantly impedes effective competition. This is the so-called SIEC-test. This covers, in particular, mergers that create or strengthen a dominant position, which was the main criterion in the former merger regulation. While the European Commission formerly could only intervene against mergers that created or strengthened a dominant position, it is now possible to intervene against mergers that significantly impede competition in other ways. According to the economic theory of oligopoly there might be mergers that restrict competition without creating or strengthening a dominant position.

With the SIEC-test, the standard in the EU came closer to the SLC-test used in the US and some would probably argue that the two tests are essentially the same. The European Commission has issued guidelines on the handling of horizontal,⁵⁸ and non-horizontal mergers.⁵⁹

The types of mergers that have the greatest potential of harming competition are the so-called horizontal mergers. A horizontal merger is a merger between competitors. These kinds of mergers may restrict competition either because the merged company strengthens its unilateral market power or because the merger makes it easier for the firms in the market to coordinate their behavior in collusion (coordinated effects). Both effects are recognized in both EU and US guidelines on horizontal mergers.

In addition, non-horizontal mergers may restrict competition. A vertical merger, which is a merger between firms on different levels in the production chain, might also result in both increased unilateral market power and facilitate coordinated effects. A vertical merger might, for instance, give the merged entity reduced incentives to supply competitors with necessary inputs. A vertical merger might also restrict competition by increasing entry barriers. The reason is that the new company may have to enter at more levels on the value chain as a result of reduced opportunities to buy from or sell to the merged entity.

Conglomerate mergers, which are mergers that are neither horizontal nor vertical, may also restrict competition. A merger between two companies selling complementary products

⁵⁸ Guidelines on the assessment of horizontal mergers under the Council Regulation on the control of concentrations between undertakings Official Journal C 31, 05.02.2004, p. 5-18.

⁵⁹ Guidelines on the assessment of non-horizontal mergers under the Council Regulation on the control of concentrations between undertakings Official Journal C 265 of 18/10/2008.

might, for instance, increase the merged entity's incentives to make products incompatible with competing products. A merger between a game console producer and a game software developer might, for instance, give the merged entity incentives to not produce games compatible with other consoles. Both vertical and conglomerate mergers are covered in the US and EU guidelines on non-horizontal mergers.

The standard for assessing mergers in both the EU and US is related to whether the merger sufficiently lessens competition. Mergers might create genuine efficiencies, and hereby increase welfare. In both jurisdictions there is an efficiency defense.⁶⁰ Recital 29 in the EMR preamble states that

[i]n order to determine the impact of a concentration on competition in the common market, it is appropriate to take account of any substantiated and likely efficiencies put forward by the undertakings concerned. It is possible that the efficiencies brought about by the concentration counteract the effects on competition, and in particular the potential harm to consumers, that it might otherwise have and that, as a consequence, the concentration would not significantly impede effective competition, in the common market or in a substantial part of it, in particular as a result of the creation or strengthening of a dominant position. The Commission should publish guidance on the conditions under which it may take efficiencies into account in the assessment of a concentration.

If the merger generates efficiencies, this may counteract the negative effects on competition, and, thus, the harm to consumers. This principle is also followed in the US and is implemented in the merger guidelines.

2.3 Antitrust procedure and antitrust evidence assessment

2.3.1 The role of the procedure

The procedure is supposed to resolve the case at issue subject to certain principles and ideals described in more detail below. By “resolving the case” in the context of this study, “reaching an antitrust decision” is meant. The procedure provides the frames for the actual antitrust analysis. Parties advocating their own interests are more or less involved in presenting arguments to the adjudicators, hoping for a decision in accordance with their interests. These parties are usually represented by lawyers, often supported by economic experts. The procedure involves both determining the rule to be applied in the case and determining the facts on which the rule is to be applied.

⁶⁰ See for instance Whish (2009) p. 863 f.

Determining the rule

The substantive antitrust rules described above determine what has to be proved in an antitrust case. However, it may be that the exact rule that is to be applied in the case in question is not indisputably established. The parties, supported by their own interests, might have different opinions on what the correct rule is and will present arguments for what the correct rule is. The decision maker must decide what rule to apply in the case.

The statutory antitrust provisions and the interpretation of these statutes by the means of valid methods of jurisprudence and legal reasoning should determine the antitrust rules. However, the properties of the procedure and the incentives of the decision maker might also influence the decision maker's determination of the rule. This will be scrutinized in more detail in Chapter Four.

The rule determines to which factual situations the rule applies, which is the factual conditions necessary to establish an antitrust violation. The question as to whether these factual conditions are present with a sufficient degree of confidence is the topic of evidence assessment.

Determining the facts

The legal procedure provides the framework surrounding the assessment of evidence. The procedural rules may have a big impact on the evidence assessment. Most jurisdictions have extensive rules on procedure. The procedural rules include issues such as the organization of the procedure, disclosure of evidence, amount of evidence, rights to contradiction, rules on admissible evidence, rules on standard of proof, and rules on burden of proof, among others. Each of these rules may have crucial influence on the assessment of evidence. Thus, taking into account the properties of the procedure is a necessary background to study the assessment of evidence in a legal context and the context of why the assessment of evidence may deviate from rationality.

The subsequent sections of this chapter describe the procedural framework for antitrust analysis, with primary attention given to the assessment of evidence. How the procedural characteristics are likely to affect the evidence assessment will be scrutinized further in Chapter Five and Six.

2.3.2 Organization of the procedure

Procedural rules

In most jurisdictions, there are three main categories of procedural rules: administrative procedure, civil procedure, and criminal procedure. These procedural rules are supported by some specialized procedural rules for antitrust.

The administrative procedure regulates the procedure when government enforcement authorities administratively enforce the law to reach an administrative decision. In the US, this procedure is regulated by the Administrative Procedure Act. The administrative procedure has, however, less impact in US than in many other jurisdictions, as much of the enforcement follows an adversarial process following the principles of civil and criminal procedure from the start. This will be explained further below. When the European Commission enforces the EU competition law, it follows an administrative procedure. The superior principles regulating the activities of the European Commission follow from the EU-treaty⁶¹ and the TFEU.⁶² The details of procedure in the European Commission's enforcement of the EU competition law are mainly regulated by specialized competition regulations. The reason is that the EU legal system does not include a general administrative law framework comparable to the framework in national jurisdictions. The procedure when the European Commission enforces the prohibitions in TFEU, Article 101 and 102, is regulated by Council Regulation 1/2003⁶³ and supplementing regulations. The procedure in the European merger control is regulated by the European merger regulation⁶⁴ (EMR) and supplementing regulations. There are also a few general regulations on the activities on European Commission and other European regulatory bodies. There are, for instance, general rules concerning access to information in the European regulatory bodies.⁶⁵

The rules of civil procedure regulate the handling of civil cases in the courts. Civil cases include both disputes between two private parties and disputes between private parties and the government in non-criminal matters. In the US, the civil procedure is regulated by Federal Rules of Civil Procedure.⁶⁶ The rules on evidence in civil cases are regulated by

⁶¹ cf. Article 17.

⁶² cf. Article 244 f.

⁶³ Council Regulation (EC) No 1/2003 of 16 December 2002 on the implementation of the rules on competition laid down in Articles 81 and 82 of the Treaty Official Journal L 1, 04.01.2003, p.1-25.

⁶⁴ Council Regulation (EC) No 139/2004 of 20 January 2004 on the control of concentrations between undertakings (the EC Merger Regulation) Official Journal L 24, 29.01.2004, p. 1-22.

⁶⁵ Regulation (EC) no 1049/2001 of the European parliament and of the Council of 30 may 2001 regarding public access to European Parliament, Council and Commission documents OJ L 145/43.

⁶⁶ Federal Rules of Civil Procedure in 28 USC.

Federal Rules of Evidence⁶⁷ which also apply in criminal cases. When parties challenge the decisions of the European Commission in the European courts, it is considered as a civil case.⁶⁸ The superior principles regulating the activities of European courts follow from the EU-treaty⁶⁹ and TFEU.⁷⁰ In addition, procedural rules regulate the procedure in the European courts.⁷¹

The rules of criminal procedure regulate the procedure in criminal cases. Criminal procedure contains many safeguards that are supposed to protect the prosecuted as the prosecuted risks severe criminal sanctions. As will be described further below, these safeguards may have several impacts on the assessment of evidence. The most serious antitrust offences are subject to criminal sanctions in many jurisdictions, including the US. In the US, the criminal procedure is regulated by the Federal Rules of Criminal Procedure⁷² and the rules of evidence in Federal Rules of Evidence. There is no criminal enforcement of the EU competition rules at the European level.⁷³ However, many jurisdictions within the EU enforce their national competition laws and EU competition law criminally. It is the national rules on criminal procedure in the various jurisdictions that apply in these cases.

Characteristics of the procedure

The two main principles of organizing legal procedure are the inquisitorial system and the adversarial system. The latter is also referred to as a prosecutorial principle in public law enforcement. In the inquisitorial system, a judge leads the investigation and makes a decision on the basis of this investigation. In the adversarial system, a party brings a dispute to the court to be decided by one or more judges or jury persons that are independent of the parties. In the latter system, the decision is based on the competing supply of evidence by the parties. Each of the parties is supposed to present the evidence they think is in favor for their position. In the case of public law enforcement, the adversarial system means that the prosecution authority or enforcement authority brings the defendant to the courts claiming

⁶⁷ Federal Rules of Evidence in 28 USC.

⁶⁸ However, when the European Commission imposes sanctions, this may be considered criminal in the meaning of the European Convention of Human rights.

⁶⁹ cf. EU-treaty Article 13.

⁷⁰ cf. TFEU Article 251 f. TFEU, Article 263 regulates the powers to overrule the decisions of the European Commission.

⁷¹ Rules of Procedure of the Court of Justice of the European Communities of 19 June 1991 (OJ L 176 of 4.7.1991, p. 7, an OJ L 383 of 29.12.1992 (corrigenda)) and Rules of Procedure of the Court of First Instance of the European Communities of 2 May 1991 (OJ L 136 of 30.5.1991, p. 1, and OJ L 317 of 19.11.1991, p. 34 (corrigenda)).

⁷² Federal Rules of Criminal Procedure in 18 USC.

⁷³ However, when the European Commission imposes sanctions this may be considered criminal in the meaning of the European Convention of Human rights.

criminal or civil sanctions to be imposed on the defendant. The prosecutor shall, in principle, bring forward all the evidence that illuminate the case, though in practice the prosecution often becomes a party who argue for conviction. The accused party has a right to defense.

Whether the process follows an inquisitorial system or adversarial system can have a big impact on what evidence is brought forward in the case and the resulting decision. In an inquisitorial system, it is the task of the inquisitor to secure that the facts are sufficiently illuminated before a decision is made. The inquisitor must collect evidence that both strengthens and weakens the hypothesis that the law is violated. The inquisitor should make a correct decision based on this evidence. The evidence collected and amount of evidence collected is in the hands of the judge. In an adversarial process, the decider is not responsible for the evidence gathering. It is the task of the parties to bring the facts to the table. The judge has limited control over the amount of evidence gathered and the types of evidence presented, except for safeguarding that the rules of evidence are followed. Either the judges themselves or the jury decides on the basis of the evidence presented by the parties.

More on procedure in US public antitrust enforcement

The adversarial principle is the basis for the US antitrust law enforcement. The prohibitions in the Sherman Act are enforced by the US DOJ Antitrust Division. Both Section 1 and Section 2 of the Sherman Act are criminal offences, but it is, in practice, only clear intentional violations of Sherman Act Section 1 that are criminally prosecuted.⁷⁴ This includes secret agreements (conspiracies) on prices, quantities, market sharing, or bid rigging. Antitrust intent requires that the action has resulted in anticompetitive effects and that the defendant knew of these probable effects or that the conduct was intended to produce anticompetitive effects, whether or not they actually occurred.⁷⁵ When the Antitrust Division thinks that it has sufficient evidence, it can bring the case to the court claiming criminal sanctions including imprisonment. The whole process, from investigation to final judgment, is regulated by the rules on criminal procedure.

The Antitrust Division can also pursue violations of the Sherman Act civilly. This is usual for violations not considered serious enough to be pursued criminally. In civil

⁷⁴ This can be partly explained by political priorities. In a press release of May 11, 2009, Assistant Attorney General Christine A. Varney expressed a more hostile practice toward monopolization practices, see http://www.justice.gov/atr/public/press_releases/2009/245710.htm. It remains to be seen whether some violations of Sherman Act Section 2 will be criminally prosecuted.

⁷⁵ See Hovenkamp (2005) p. 593.

investigations, a so-called Civil Investigative Demand (CID)⁷⁶ is issued. Civil fines are not available, but other remedies may be claimed. This will often be a cease and desist order. Similarly to the criminal cases, the claims must be brought to the courts as a complaint.⁷⁷ The civil enforcement is regulated by civil procedure (Federal Rules of Civil Procedure and Federal rules of Evidence).⁷⁸

Many cases settle with consent decrees that must be approved by the court. The consent decrees can be enforced in the court as other court orders. Consent decrees are beneficial for the defendant in that they cannot be used as *prima facie* evidence in civil cases.⁷⁹ Furthermore, the Antitrust Procedures and Penalties Act require that the settlement is announced 60 days before it is consummated. The Antitrust Division must also issue a “competitive impact statement” that makes it possible for the court to check that the settlement is in accordance with “public interest”.⁸⁰ The Antitrust Division can also claim damages on behalf of the US government.

The FTC does not have the jurisdiction to enforce the Sherman Act; however, it enforces the FTC Act. According to the FTC Act, Section 5,⁸¹ the FTC can intervene against “*unfair methods of competition*”. This provision has been interpreted to cover all conduct that is illegal according to the Sherman Act.⁸² The administrative procedure in the FTC is regulated by the FTC Act, Section 5, and the Federal Administrative Procedure Act. The process is a quasi-judicial process based on an adversarial system.⁸³ This process is managed by an administrative law judge, independent of the investigators and “prosecutors” in the FTC. The FTC claims remedies that have effects after they enter into force. The process is similar to a judicial process with presentation of evidence, interrogation of witnesses, and so on. The administrative law judge makes a decision based on this procedure that can be either approved or rejected by the Commission. The decision of the Commission can be challenged in the ordinary appeal courts.

The Clayton Act is enforced by both the DOJ Antitrust Division and the FTC. In practice, the two authorities will inform each other before they handle a case, and a division of labor prevents that same case being handled at both places. The Clayton Act includes

⁷⁶ See Hovenkamp (2005) p. 594.

⁷⁷ See Gellhorn et al. (2004) p. 527.

⁷⁸ See OECD (2010).

⁷⁹ See Hovenkamp (2005) p. 595.

⁸⁰ 15 USC 16. See Gellhorn et al., p. 527-528.

⁸¹ 15 USC 45.

⁸² See Hovenkamp (2005) p. 596.

⁸³ See OECD (2010). See Hovenkamp (2005) p. 597 for a description of the process.

merger control. The parties of merger may have a duty to notice the merger dependent on, inter alia, the size of the merging parties and the size of the transaction as such.⁸⁴ As a starting point, the parties have to wait 30 days after the notification for the consummation of the merger. If the DOJ wants to challenge the merger, it must be brought to the court with a claim of outright prohibition or with an approval subject to remedial commitments. This procedure can also be solved with consent decrees. If the FTC wants to challenge a merger, it follows the same procedure as in the enforcement by the Antitrust Division, except that the claim will be presented to an administrative law judge subject to approval by the Commission and judicial review by the courts.

More on procedure in EU public enforcement

The enforcement of competition law in the EU and many of the national jurisdictions in the EU is still best characterized as an inquisitorial system or, more precisely, a mixed system.⁸⁵ The EU competition laws are enforced centrally by the European Commission and locally by the competition authorities of the member states. The enforcement of the prohibitions in TFEU Articles 101 and 102 is regulated by Council Regulation 1/2003⁸⁶ and supplementing regulations, such as Commission Regulation 773/2004.⁸⁷ Regulation 1/2003, Articles 4 and 5, gives the European Commission and the competition authorities of the member states the powers to enforce Articles 101 and 102. Article 6 gives national courts the powers to make decisions concerning Articles 101 and 102.

The European Commission consists of commissioners from the various member states. The election of commissioners and the powers of the European Commission are regulated by the EU-treaty, Article 17, and TFEU Part 6, Articles 244 et seq. The main rule is that the European Commission decides according to majority voting, cf. TFEU, Article 250. The European Commission's enforcement of the competitions rules is organized within DG COMP, headed politically by a commissioner and administratively by a Director General. The commissioners act independently of the member states they are from, and their loyalty should be to the EU as such.

⁸⁴ See Hovenkamp (2005) p. 598.

⁸⁵ Posner (2011), p. 852 uses the term "mixed system" for a system of inquisitorial public enforcement subject to judicial review. See also Parisi (2002).

⁸⁶ Council Regulation (EC) No 1/2003 of 16 December 2002 on the implementation of the rules on competition laid down in Articles 81 and 82 of the Treaty Official Journal L 1, 04.01.2003, p.1-25.

⁸⁷ Commission Regulation (EC) No 773/2004 of 7 April 2004 relating to the conduct of proceedings by the Commission pursuant to Articles 81 and 82 of the EC Treaty Official Journal L 123, 27.04.2004, p. 18-24. Commission Regulation 773/2004 is the implementing regulation to Regulation 1/2003.

Chapter V in Council Regulation 1/2003 regulates the Commission's investigative powers in the enforcement of TFEU Articles 101 and 102. Regulation 1/2003, Article 18, gives the Commission the powers to gather information from undertakings and associations of undertakings. Article 19 gives the commission powers to interrogate and interview physical and legal persons by their representatives. Article 20 gives the Commission the powers to do inspections (dawn raids) at the premises of undertakings and associations of undertakings. Under more strict conditions, Article 21 gives the Commission powers to perform inspections on other premises, where private homes are the most practical. During the investigation the undertakings investigated have access to documents and a right to contradiction. This is regulated by Chapter VIII of Regulation 1/2003 and by the implementation regulation. The interested parties have a right to be warned before the Commission makes its decision. This is implemented as a duty for the Commission to issue a statement of objection (SO), cf. Article 27 of Regulation 1/2003. The case handling in EU must also satisfy the requirements set out in the European Convention of Human Rights.

There has been some dissatisfaction expressed by legal scholars and the legal society that the Commission, as one body, acts as investigator, prosecutor and decision maker.⁸⁸ The Commission has made some reforms to address this issue and separate the roles. A separate hearing officer ensures that the hearings in the case are performed satisfactory, and a chief economist outside the administrative hierarchy of the case gives advice to the decision makers. Since it is the European Commission as a collegial body that makes the decision, and the commissioners are not involved in the investigation of the case, there will be some degree of separation between the investigation on the one side and the decision making on the other side. Furthermore, the case will always be reviewed by the Legal Service of the Commission before a decision is made. According to Regulation 1/2003, Article 14, the Commission has to consult the Advisory Committee, consisting of member state representatives, before a decision is made. The decisions of the Commission can be challenged in the courts. This will be described further below.

The enforcement of the merger regulation is regulated by the European Merger Regulation (EMR) and supplementing rules. The enforcement rules in the EMR have many commonalities with the enforcement of TFEU Articles 101 and 102 given in Regulation 1/2003. The framework is different though, as the regulation of merger is mainly about the regulation of planned mergers and not violation of a prohibition. The merger decisions of the

⁸⁸ See OECD (2010) and Geradin and Petit (2010).

Commission can be challenged in the courts. This will be described further below. The EMR contains rules of procedure including rights for the parties during the procedure. EMR, Article 11, gives the Commission powers to request information from persons that might possess relevant information, including the parties, of course. According to EMR Article 13, the Commission can perform inspections. The Commission might also impose a duty for the national competition authorities to perform inspections. EMR Article 18 regulates the interested parties' access to hearings and rights to contradiction. The parties have the right to be heard and to exercise their right to contradiction on the different stages in the case handling. The Commission has issued guidelines on best practice in the handling of mergers.⁸⁹

The legality of the decisions of the European Commission, both according to Regulation 1/2003 and EMR, can be brought to the union courts, cf. TFEU, Article 263.⁹⁰ When the affected parties want to challenge a decision by the European Commission, the General Court⁹¹ handles the case in the first instance. The European Court of Justice (ECJ) is the appeal body and final court, cf. TFEU, Article 256. The right to have the fines issued by the European Commission challenged by court is stated in Regulation 1/2003, Article 31 and EMR, Article 16, which both state that the Court of Justice shall have unlimited jurisdiction to review decisions whereby the Commission has fixed a fine or periodic penalty payment. It may cancel, reduce, or increase the fine or periodic penalty payment imposed. This possibility to give the courts unlimited jurisdiction on such penalty review follows from TFEU Article 261.

A quick comparison of the US and EU public enforcement systems shows that the EU enforcement system is best characterized an inquisitorial system⁹², where the European Commission investigates, "prosecutes" and decides the case. If the decision is challenged in the courts, it then follows an adversarial system. It is then the parties who have the initial burden to establish that there was an error in the Commission's decision. Furthermore, limits in the courts' standard of review⁹³ make the system quite different compared to following an adversarial system from day one. In the US, on the contrary, the adversarial system, as a main

⁸⁹ DG Competition Best Practices on the conduct of EC merger proceedings 20/01/2004.

⁹⁰ If the Commission fails to act when it should have acted, this failure to act can also be brought to the European courts, cf. TFEU, Article 265.

⁹¹ Formerly called the Court of First Instance (CFI).

⁹² More precisely a mixed system.

⁹³ The standard of review will be discussed in more detail below.

rule, governs the case from day one. The US authorities must bring the case to the court (or a court substitute in FTC cases) that makes the decision after an adversarial process.

Private enforcement

Private enforcement of the antitrust laws supplements the public enforcement. Private parties may challenge a violation of antitrust law for several reasons. Firstly, a person that has suffered economic loss because of a violation has an interest in seeking damages. Furthermore, a harmed private party might have an interest in an injunction to be imposed at the alleged violator, bringing the violation to an end. In addition, it might be in the interest of a private party that a contract in violation of antitrust law is declared void without legal effect.

About 90 percent of the enforcement of antitrust law in the US is private.⁹⁴ This can partly be explained by cultural and historical circumstances, but also by a legal framework that encourages private enforcement, especially in antitrust law. The legal framework for damages in the US allows for punitive damages, which gives damages an increased deterrent role. The main rule in US tort law is that the penal element of damages is a matter of court discretion based on the appropriateness of punitive damages in the specific case. In antitrust, however, punitive damages are regulated by Clayton Act, Section 4.⁹⁵ Clayton Act, Section 4, states a right for treble damages, which is a right to threefold the damages suffered. This provision has probably boosted the incentives for damages litigation.

Some measures have been taken to prevent perverse incentives, though. One example is *Brunswick*,⁹⁶ where a local bowling hall sued a bowling chain, after the chain had acquired a competing local bowling hall on the edge of ruin. Consequently the bowling hall remained in the market and became a more efficient competitor to the plaintiff bowling hall. As anticompetitive mergers are prohibited in the US, it is possible for private parties to challenge mergers. The Supreme Court stated that the plaintiff had no standing as the alleged damages were not a result of antitrust injury, which is an injury of the type the antitrust laws were intended to prevent and that flows from what makes the defendant's conduct unlawful. This is logical, as the injury the plaintiff suffered was a result of increased competition and not anticompetitive conduct. The concept of antitrust injury is now established in US antitrust case law, and has probably played an important role in discouraging the extent of non-meritorious and non-desirable private litigation.

⁹⁴ See Hovenkamp (2005) p. 602.

⁹⁵ 15 USC 15.

⁹⁶ *Brunswick Corp. v. Pueblo Bowl-O-Mat, Inc.*, 429 U.S. 477 (1977).

In the US, the main rule is that each party bears its own costs. This is on the contrary to many European jurisdictions, where the losing party must cover the winning party's litigation costs. In the antitrust damages litigation, however, an exemption of this main rule is given in Clayton Act, Section 4.⁹⁷ Here, the main rule is that the defendant must cover the plaintiff's cost in case of unfavorable judgment for the defendant. This also encourages private enforcement. The private enforcement in the US follows an adversarial procedure according to the rules of civil procedure.

In EU competition law, there are, at the time of writing, no harmonized legal framework of private enforcement. Thus, the right to damages to persons who suffer injury after a violation of competition law is regulated by the national laws of the various member states and follows the rules of civil procedure therein. However, the principles of effectiveness and equivalence impose some requirements on the national laws. From *Courage*,⁹⁸ it follows that the member states are obliged to secure the rights to damages after violations of EU competition law. To strengthen the private enforcement in the EU, the European Commission published a Green Paper in 2005 addressing measures to increase the almost non-existent private enforcement of competition law in the EU.⁹⁹ This was followed by a White Paper in 2008 suggesting measures to secure damages for those who suffer injury after violations of EU competition law.¹⁰⁰ One measure was a suggestion to provide non-binding guidance for national courts on the quantification of damages. A group of experts assigned by the European Commission performed a study on principles to quantify antitrust damages in 2009.¹⁰¹

Despite attempts to encourage private enforcement of the competition laws in the EU, there might be principles in the tort law in the EU member states that prevent the same extent of private enforcement in the EU as in the US. For instance, European jurisdictions normally limit damages to economic losses, interest on the losses, and nothing more.¹⁰² This principle is an obstacle to specialized rules that encourage private enforcement, such as punitive damages or rules that in other ways give some groups rights to damages exceeding their economic loss.

⁹⁷ 15 USC 15.

⁹⁸ *Courage Ltd. v. Bernhard Crehan*, ECJ Case C-453/99, [2001].

⁹⁹ Green Paper - Damages actions for breach of the EC antitrust rules COM(2005) 672, 19.12.2005.

¹⁰⁰ White Paper on Damages Actions for Breach of the EC antitrust rules COM(2008) 165, 2.4.2008.

¹⁰¹ Oxera (2009), External study on the quantification of harm suffered by victims of competition law infringements, http://ec.europa.eu/competition/antitrust/actionsdamages/quantification_study.pdf.

¹⁰² Dependent on the jurisdiction the losing party may have to reimburse the litigation costs of the winning party.

2.3.3 Rules on admissible evidence

The rules on admissible evidence have a direct impact on the assessment of antitrust evidence. Rules on how much evidence is allowed may indirectly affect what evidence enters into court. Rules that directly regulate the admissibility of a particular piece of evidence might be crucial to the evidence assessment. The decision might change if some important evidence is not allowed to be disclosed to, or used by, the one who assesses the evidence. This section will offer a brief presentation of the regulations that affect the amount of evidence in litigation and the rules governing the admissibility of evidence.

Amount of evidence

The amount of evidence presented in a case is partly a question of economics. To gather, assess, and present evidence involves costs. Incurring these costs may increase the likelihood of a correct decision, or at least a more informed decision. Thus, there is a tradeoff between costs and benefits. This tradeoff is central to the decision theoretic analysis that will follow in the subsequent chapters of this study. In an adversarial process the amount of evidence is mainly determined by the parties involved. A party will weigh the cost of gathering evidence against the benefits. One party's presentation of evidence may trigger a need for the opposite party to gather and present evidence. In principle, the amount of evidence is determined by the cost of gathering evidence and the parties' stakes in the outcome of the case. The competitive process is supposed to secure a sufficient amount of evidence. This competitive process in presenting evidence is analyzed in Chapter Five and Six. The court may impose some restrictions on the amount of evidence. Firstly, the court has discretion in deciding the time frame of the process. Furthermore, the courts may refuse the parties to present relevant evidence if, for instance, the factual issue is already resolved. Relevance of evidence will be discussed further below. Since the adversarial system is the main principle in US antitrust enforcement, the competitive dynamics will mainly regulate the supply of evidence.

Some specific regulations to secure a sufficient amount of evidence are more important in an inquisitorial system. These rules are supposed to encourage the inquisitor to illuminate the facts of the case to a sufficient degree. Rules to illuminate the case include both rules that directly regulate the amount of evidence and rules that safeguard the illumination of the facts, for instance, rights to contradiction in the process. When the European Commission enforces the prohibitions in the TFEU or performs merger control, the Council Regulation 1/2003 and the EMR, respectively, state the rights to contradictions and duties for the Commission to hold hearings. TFEU Article 263 (2) states that the courts in the review of the

legality of the acts of the European Commission have the jurisdiction in challenging, inter alia, whether there was an “*infringement of an essential procedural requirement*”. This includes challenging whether the European Commission has provided sufficient reasons for its decisions. This will be discussed further in the section on standard of review below.

Relevant evidence and admissibility

The US statutory rules on admissible evidence are more extensive than those in EU procedure and many of the European jurisdictions. However, the right to a fair trial following from the European Convention on Human Rights provides some basic restrictions on admissible evidence since the European Convention on Human Rights applies in EU procedure. The process around evidence in the EU is, overall, less regulated, and it is up to the court to assess the relevance and weight of the evidence presented. In the US, the extensive use of juries in the assessment of the facts makes it more practical for judges to be gatekeepers for the evidence presented in court. By declaring evidence as inadmissible in a separate procedure, the jury is refused access to the evidence. This separation of the role of the judge as an evidence administrator and the role of the jury to assess the evidence makes it possible to prevent inadmissible evidence coming to the knowledge of the fact-deciding jury.

The statutory provisions in the Federal Rules of Evidence (FRE) are a good starting point for describing what relevant evidence is and what evidence should be admissible. As a starting point, all evidence that contributes to resolving the factual uncertainty should be admissible. FRE Rule 401 states that

“Relevant evidence” means evidence having any tendency to make the existence of any fact that is of consequence to the determination of the action more probable or less probable than it would be without the evidence.

Thus, relevant evidence is all evidence that has a tendency to make a hypothesis regarding the facts more or less probable. FRE Rule 402 states that

All relevant evidence is admissible, except as otherwise provided by the Constitution of the United States, by Act of Congress, by these rules, or by other rules prescribed by the Supreme Court pursuant to statutory authority. Evidence which is not relevant is not admissible.

Thus, admissibility is dependent on relevance in the US. In the EU there will probably not be such a strict ex ante test on relevance to determine admissibility based on relevance; but

however, as a matter of logic, the courts or European Commission should not give any weight to evidence that does not satisfy the relevance test. EU courts will normally ask critical questions if they are presented evidence where the courts do not see the relevance. If relevance in such a situation cannot be explained, the party may be refused the further presentation of the evidence.

As stated in FRE Rule 402, even relevant evidence might be inadmissible if statutory rules say so, or it is prescribed by the Supreme Court pursuant to statutory authority. In the EU, there are also some restrictions on the admissibility of relevant evidence. This will be discussed further in the following subsection.

Restrictions on admissibility of relevant evidence

Some evidence that satisfies the relevance test may still be inadmissible. Inadmissibility of relevant evidence may serve various purposes. Firstly, if some factual issue is already resolved, more evidence supporting already established facts might be a waste of time. Another reason is that some evidence may appeal to people's prejudices and be given wrong weight as a result of these prejudices. Some evidence may confuse more than they resolve the facts. All these reasons are valid reasons for the US courts to declare evidence inadmissible according to FRE Rule 403.

Most jurisdictions have some rules implementing a preference of evidence in more direct form to evidence in a more indirect form. For instance, it is considered better to have the witness in court than some records of the witness' statement. Furthermore, it is better to have statements from a witness who was a direct observer than some witness providing statement about the observations of a direct observer. The reason is that it is easier to cross-examine a direct witness. In the US, the inadmissibility of hearsay evidence is extensively regulated in FRE Rule 801 and the subsequent rules.

A special type of witnesses is an expert. In antitrust cases, experts will typically be economists or industry experts. Most jurisdictions have special rules regulating the use of experts in court. In the US, only experts are allowed to make factual inferences (opinions), cf. FRE Rule 701. Some experts might be appointed by parties and some might be court appointed. In *Daubert*¹⁰³ and many subsequent rulings, the US Supreme Court stated principles for the use of expert witnesses. The principles on the use of expert witnesses are now at least partially implemented in FRE 702, which states that

¹⁰³ *Daubert v. Merrell Dow Pharmaceuticals, Inc.* 509 U.S. 579 (1993).

scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise, if (1) the testimony is based upon sufficient facts or data, (2) the testimony is the product of reliable principles and methods, and (3) the witness has applied the principles and methods reliably to the facts of the case.

Federal Judicial Center (2000) provides guidelines on the use of scientific evidence. The European Commission has issued best practices for the submission of economic evidence.¹⁰⁴ The use of experts in antitrust analysis, and, in particular, the use of economic experts presenting evidence based on economic models will be studied in detail in Chapter Six.

The admissibility of some types of relevant evidence might result in some undesirable incentives ex ante. For instance, if helping someone after an accident is accepted as evidence in support of admission of guilt, this might provide poor incentives to providing such help.¹⁰⁵ There are many rules that, at least partially, have the purpose of avoiding undesirable incentives ex ante. In most civilized jurisdictions, no person is obliged to incriminate himself. In the US, this follows from the Fifth Amendment to the constitution. In EU the privilege against self-incrimination follows from the European Convention on Human Rights, Article 6. Allowing self-incriminating evidence might give incentives to put undesirable pressures on defendants to confess, which again might increase the likelihood of false confessions. This may reduce the accuracy of the decisions, which ultimately could reduce the deterrent effect of rules. Imposing certain witnesses a duty to witness may also provide undesirable incentives ex ante. A duty for medical doctors to witness in court might prevent people seeking medical treatment. A duty for family members to witness against each other might be destructive to family life. In antitrust law, the privilege for attorney-client correspondence is of particular relevance. If this kind of evidence was not privileged, persons might avoid seeking legal advice ex ante. This might both reduce compliance with the law and reduce legal certainty. In the US, the privilege against attorney-client correspondence is regulated in FRE Rule 502. In the EU this privilege follows from case law.¹⁰⁶

This was relatively brief review of the rules on admissible evidence. The topic is broad and can fill volumes. The rules of admissible evidence are highly practical and have

¹⁰⁴ DG Competition, Best practices for the submission of economic evidence and data collection in cases concerning the application of TFEU, Articles 101 and 102 and in merger cases, Staff working paper, http://ec.europa.eu/competition/antitrust/legislation/best_practices_submission_en.pdf.

¹⁰⁵ See FRE Rule 409.

¹⁰⁶ AM&S Europe Ltd. v Commission Case 155/79. See Graver and Hjelmeng (2006) p. 140.

substantial impact on assessment of evidence in practice. These rules will be further discussed in Chapter Five and Six.

2.3.4 Standard of proof

The standard of proof is the degree of confidence in the correctness of facts that must be established to apply the law to those facts. The starting point is that the standard of proof in civil cases is balance of probabilities, which means that the most probable fact is used for the application of the law. This is also referred to as preponderance of evidence. In criminal cases, the starting point is that there can be no reasonable doubt in the correctness of the facts for basing criminal liability on these facts. Between the two starting points there are intermediate solutions. A higher standard of proof than balance of probabilities might apply in civil cases involving administrative sanctions imposed by a public enforcement authority. In some situations, a lower standard of proof than balance of probabilities might apply. Sometimes, authorities will, for instance, be granted a court order to perform investigative measures against persons based on mere suspicion. The decision theoretic explanation for some standard of proof other than balance of probabilities is that the risk involved in erring in one direction is worse than the risk of erring in the other direction. This consideration will be central in the discussion in Chapter Five.

Proof beyond reasonable doubt must be established for criminal liability for violating the Sherman Act. The standard of proof in civil antitrust cases in the US is, as a starting point, balance of probabilities. However, the US Supreme Court has decided that the standard of proof will depend on the circumstances and experiences.¹⁰⁷ Thus, the standard of proof partly depends on the type of the case and the specific circumstances of the case. In the US, there are no administrative fines in antitrust cases. However, in cases where the court finds that a decision imposes heavy burdens on the parties, it might require clear and convincing evidence.

Regulation 1/2003 does not regulate the standard of proof in the European Commissions' enforcement of TFEU, Articles 101 and 102. In the EU, the normal standard of proof in civil cases is, as a starting point, balance of probabilities. However, it has been argued by scholars that when fines are issued there is a higher standard of proof.¹⁰⁸ In *Microsoft*,¹⁰⁹ Paragraph 89, the court stated that

¹⁰⁷ *Keyes v. Sch. Dist. No. 1*, 413 U.S. 189 (1973). See also Pardo (2010).

¹⁰⁸ See Graver and Hjelmeng (2006) p. 149f. See also Wils (2006) p. 69.

¹⁰⁹ *Microsoft Corp v. Commission*, Case T-201/04, CFI, 2007.

The Community Courts must not only establish whether the evidence put forward is factually accurate, reliable and consistent but must also determine whether that evidence contains all the relevant data that must be taken into consideration in appraising a complex situation and whether it is capable of substantiating the conclusions drawn from it (see, to that effect, concerning merger control, Case C-12/03 P Commission v Tetra Laval [2005] ECR I-987, paragraph 39).

Instead of speaking of probabilities directly, the court stated that evidence must be factually accurate, reliable and consistent. The same standard applies in merger control. Thus, this might seem to be the general standard of proof applied by the European Commission.

When EU competition law is enforced by the member states, the standard of proof in the various national jurisdictions applies. If the EU competition laws are criminally enforced by the member states, proof must be established beyond reasonable doubt.

2.3.5 Burden of proof

The burden of proof is about which party has to establish the facts according to the standard of proof. Normally, it is the one alleging that some factual situation is present who has the burden of proof in establishing that fact. If, for instance, the antitrust authorities or some private party claims that some person has violated the antitrust laws, it is the claimant who must prove this violation according to the standard of proof. If the claimant establishes this fact by presenting evidence, it is up to the defendant to “neutralize” this by his own presentation of evidence. This is a starting point. Factual presumptions will switch the burden of proof to the one having the presumption against him.

A presumption means that some facts, Y, are presumed to establish facts X. In antitrust, some established facts on the structure of the market (Y) may be used to presume some anticompetitive effects (X), even where X is not proven as such. Presumptions might be used to switch the burden of proof to the party who can prove something at lowest cost, by letting the presumption be in disfavor to the one who has the incentives to refute the presumption. Presumptions can thus be used to reduce the cost of the process and to facilitate better illuminated facts. In practice, the burden of proof will shift back and forth as the case proceeds. It is a dialectical process.

In the US, most cases follow the adversarial system. It will be the court who decides if there is enough evidence for finding a violation based on the evidence put forward. The opposite party must decide to either take the risk that the opposing party has not presented sufficient evidence or to present his own neutralizing counter-evidence. The court will use presumptions in the assessment. As described above, the courts have developed many

presumptions in the application of the provisions in the Sherman Act. The separation between per se violations and rule of reason have blurred developed into a system of presumption rules.¹¹⁰ Presumptions also apply in merger control. If, for instance, parties in a horizontal merger have high enough market shares, anti-competitive effect might be presumed without proof that the merger will actually result in a substantial lessening of competition. It will then be up to the merging parties to refute this presumption, for instance, by presenting evidence of low entry barriers. Such evidence might trigger a need for the plaintiff to establish that the entry barriers are not as low as claimed by the parties, and so on.

According to Regulation 1/2003, Article 2, it is the European Commission or the national competition authority that has the burden to prove a violation of TFEU, Article 101, Paragraph 1, and Article 102. An undertaking claiming the benefit of Article 101, Paragraph 3, has the burden to prove that the conditions are satisfied. However, as described above, by the distinction between conduct that restricts competition by object and that restricts competition by its effects, the courts have established more precise presumption rules. This also applies to TFEU Article 102. When it comes to merger control, it is, as a starting point, the European Commission that has to prove that the conditions for prohibiting the merger are present. However, from established practice and the merger guidelines, it follows that it is the parties that must put forward evidence for efficiency gains.

A difference between the EU and the US is that the first part of the process is inquisitorial. Thus, it will be up to the European Commission as both fact-finder and decision body to decide if they think some presumption is refuted by the party that is investigated.

This evolution of presumption rules and the rational use of presumptions in evidence assessment are central issues in Chapter Four and Chapter Five.

2.3.6 Standard of review

Standard of review is the body of principles used by an appellate decision body in reviewing the decision of a lower-level decision body. The most common example is the body of principles the appeal courts use to review the decisions of the lower courts. Typically, there might be limits on the appellate body's powers to review the assessment of evidence in lower courts. One reason for restrictions in the standard of review is efficiency considerations. Jury trials are expensive, and a full review of facts with a new jury might not improve the assessment but simply replace one assessment with another. Thus, a better standard of review might be to review if there have been procedural errors that have been likely to affect the

¹¹⁰ Gavil (2008) studies the burden of proof in US antitrust law.

assessment of evidence, or if there are reasons to believe that there have been manifest errors in the assessment of the evidence. The finding of such errors might justify an annulment, and the appeal court may order a new jury trial in the lower court.

The standard of review in the US is dependent on the type of procedure and the issue in question. The content of the standard of review is subject to substantial case law practice. It is beyond the scope of this study to survey this practice. As a main rule, the finding of facts in US jury trials is subject to a clearly erroneous review in both civil¹¹¹ and criminal¹¹² proceedings. The Federal Rules of Civil Procedure, Rule 52 (a) 6 states that “*Findings of fact, whether based on oral or other evidence, must not be set aside unless clearly erroneous*” when the appellate court reviews the case.

Another reason for a limited review is the expert character of lower decision bodies. Furthermore, the decision of a lower level expert decision body may involve policy questions that are not suitable for appeal courts to assess. In the US the decisions of administrative bodies, such as the decisions from the FTC, are subject to limited review of the facts. The FTC’s finding of fact is reviewed under the substantial evidence standard.¹¹³ Under this standard, the FTC’s finding of facts will be upheld if they are supported by “*such relevant evidence as a reasonable mind might accept as adequate to support a conclusion.*”¹¹⁴

An issue that becomes relevant in inquisitorial systems like in the EU, where the inquisitorial body makes a decision subject to adversarial judicial review, is the standard of review to be applied to the decision of the inquisitorial body such as the European Commission. This is a different kind of review than the appellate review in the US. In the US, the first decision has been subject to an adversarial procedure. A limited judicial standard of review of a decision by the European Commission means that the access to a full scrutiny of the case in an adversarial procedure is limited. As mentioned above, the expert and policy natures of such decision bodies might justify a limited review. This is the case in EU competition cases, as the courts have established a limited review when it comes to challenging the legality of the European Commission’s decisions according to TFEU Article 263. As a starting point the courts exercises a full review of both law and facts. The full review of law is stated explicitly in TFEU, Article 263. When it comes to the facts, the court stated in *Italian Flat Glass* that

¹¹¹ See, for instance, *Husain v. Olympic Airways*, 316 F.3d 829 (9th Cir. 2002), affirmed in 540 U.S. 644 (2004).

¹¹² See for instance *United States v. Stoterau*, 524 F.3d 988, 997 (9th Cir. 2008).

¹¹³ *California Dental Ass’n v. FTC*, 128 F.3d 720 (9th Cir. 1997). Vacated on other grounds in 526 U.S. 756 (1999).

¹¹⁴ *California Dental Ass’n v. FTC*, 128 F.3d 720 (9th Cir. 1997) at 725.

*it is incumbent on it [...] to check meticulously the nature and import of the evidence taken into consideration by the Commission in the decision.*¹¹⁵

When it comes to challenging complex economic evidence assessments, however, the ECJ has stated that the standard of review is restricted. In *Consten and Grundig*, the ECJ stated that

*the exercise of the commission's powers necessarily implies complex evaluations on economic matters. A judicial review of these evaluations must take account of their nature by confining itself to an examination of the relevance of the facts and of the legal consequences which the commission deduces therefrom. This review must in the first place be carried out in respect of the reasons given for the decisions which must set out the facts and considerations on which the said evaluations are based.*¹¹⁶

This limited standard of review has been repeated in many cases. In *Thyssen-Stahl*, the ECJ stated that

*it should be borne in mind that, although as a general rule the Community judicature undertakes a comprehensive review of the question whether or not the conditions for applying the competition provisions of the EC and ECSC Treaties are met, its review of complex economic appraisals made by the Commission is necessarily limited to verifying whether the relevant rules on procedure and on the statement of reasons have been complied with, whether the facts have been accurately stated and whether there has been any manifest error of appraisal or misuse of powers.*¹¹⁷

Thus, the EU commission benefits from a wide discretion in assessing complex economic matters being subject to a review of manifest errors. This was further substantiated in *Alrosa*, where the ECJ stated that

In paragraphs 129 to 136 of the judgment under appeal, the General Court expressed its own differing assessment of the capability of the joint commitments to eliminate the competition problems identified by the Commission, before concluding in paragraph 154 that alternative solutions that were less onerous for the undertakings than a complete ban on dealings existed in the present case. By so doing, the General Court put forward its own assessment of complex economic circumstances and thus substituted its own assessment for that of the Commission, thereby encroaching on the discretion enjoyed by the Commission instead of reviewing the lawfulness of its

¹¹⁵ *SIV v. Commission*, Joined Cases T-68/89, T-77/82 and T-78/89, [1992] para. 95.

¹¹⁶ *Établissements Consten S.à.R.L. and Grundig-Verkaufs-GmbH v Commission of the European Economic Community* Joined cases 56/64 and 58/64 [1966] p. 347

¹¹⁷ *Thyssen Stahl AG v Commission of the European Communities* Case C-194/99 [2003] p. 78.

*assessment. That error of the General Court in itself justifies setting aside the judgment under appeal.*¹¹⁸

Thus, the courts cannot replace the Commission's assessments of complex economic matter with their own.

That said, the ECJ stated in *Tetra Laval* that the limited standard of review of complex economic matters

*does not mean that the Community Courts must refrain from reviewing the Commission's interpretation of information of an economic nature. Not only must the Community Courts, inter alia, establish whether the evidence relied on is factually accurate, reliable and consistent but also whether that evidence contains all the information which must be taken into account in order to assess a complex situation and whether that evidence contains all the information which must be taken into account in order to assess a complex situation and whether it is capable of substantiating the conclusions drawn from it.*¹¹⁹

Thus, although the courts recognize a limited standard of review, they are quite intense in exercising their powers within that limited standard of review.¹²⁰

TFEU, Article 261, states that

Regulations adopted jointly by the European Parliament and the Council, and by the Council, pursuant to the provisions of the Treaties, may give the Court of Justice of the European Union unlimited jurisdiction with regard to the penalties provided for in such regulations.

As described above, Regulation 1/2003 and the EMR give the courts such powers. Thus, when it comes to fines issued by the European Commission, the ECJ has unlimited jurisdiction.¹²¹

¹¹⁸ European Commission v Alrosa Company Ltd Case C-441/07 [2010] para. 66-68.

¹¹⁹ Commission v. Tetra Laval C-12/03 [2005] para. 328.

¹²⁰ See Gavil and Petit (2010) for a further analysis of the judicial standard of review in EU competition law.

¹²¹ There is, however, a debate whether the courts practice such unlimited jurisdiction. See Gerard (2010). A topic associated with this issue is whether a limited review of fines complies with the European Convention on human Rights, Article 6 regarding fair trial. This was discussed by Advocate General (AG) Sharpston in her Opinion in the KME-case (C-272/09 P). A further discussion of this topic is beyond the scope of this study.

3 An analytical framework for rational antitrust analysis

3.1 Introduction and motivation

This chapter offers a more precise description of the various components of antitrust analysis and a basic framework for assessing the rationality of antitrust analysis. A theoretical framework for rational decisions will be presented and it will be described how this is to be applied to the various components of antitrust analysis. Furthermore, the principles of rational analysis will be briefly related to how antitrust analysis is actually performed. The latter topic will only be discussed at a superficial level, which will serve as a basis for the detailed studies in the subsequent chapters of this study.

This framework is intended to connect the research that will follow in the subsequent chapters of this study. In addition, this chapter also raises some independent research questions. The chief research questions of this chapter are: *What is a rational antitrust analysis? Can and should the principles of rationality guide antitrust analysis?* The last question is essential in determining the value of proceeding with the study of rationality in antitrust analysis.

3.2 What is antitrust analysis?

Antitrust analysis is the analysis used when some event is scrutinized under the antitrust laws. If persons involved in the antitrust enterprise are asked what antitrust analysis is, some would probably say it is determining the content of the correct antitrust legal rule to be applied for the facts in question. Some would reply that it is the assessment of the relevant facts in an antitrust case given the legal rule. Most would probably agree both of these answers, as does the approach in this study. Analysis means to divide a complex issue into smaller parts to study it better. The main components of every antitrust case are the assessment of law and the assessment of facts. Both of these assessments might themselves be complex issues to be analytically divided into smaller parts for further assessment.

Thus, the components of antitrust analysis consist both of the application of legal method to determine what the appropriate legal rule is and to assess whether the facts to apply the legal rule are in place. The first component is a question of interpretation of law and is solved by the appropriate legal method of the jurisdiction in question. This involves interpreting legal sources and applying valid methods of legal reasoning to determine the law.

The second component of antitrust analysis normally involves more or less assessment of evidence. In complex cases, the application of science might be necessary to assess the

evidence. Forensic science is about the application of science in the assessment of legal evidence. Most people are familiar with forensic medicine through popular fiction, but other sciences also have an important role in the assessment of evidence in legal cases.¹²² In antitrust cases economics is the most relevant science to aid the assessment of evidence.¹²³ Economic models of competition are used to assess whether it is likely that that some particular behavior restrict competition or whether it is likely that the market outcome is the result of some illegal anticompetitive behavior.

Sometimes it is difficult to distinguish between the determination of the legal rule and the assessment of evidence. Assume that there is an exclusivity agreement that is under antitrust scrutiny. Let us, for simplicity, say that the statutory law states that agreements that restrict competition to the detriment of consumers are prohibited. In principle, the legality of the agreement could be assessed fully by legal method. The relevant sources of law and the principles of legal reasoning would then be used to construct a rule regulating the particular exclusivity agreement in question. Former legal decisions are used as precedence, and principles of reasoning, like the use of analogy, can be used to either argue for a rule that prohibits the exclusivity agreement in question or that the agreement falls outside the prohibition. On the other side, one could approach the legality of the exclusivity agreement by assessing evidence. Economic analysis would then be used to assess whether the agreement is likely to restrict competition to the detriment of consumers.

Which method should be used is a question of whether one should consider the law as a standard or whether there is a specific rule that regulates the agreement in question. After reading a court decision or opening a textbook on antitrust law of the US or EU jurisdictions, it is soon apparent that it is not clear whether the legal status of various activities has been assessed according to the method of law, as an assessment of facts against a standard, or a combination of both. This is not unique to antitrust. In almost all areas of law, and most jurisdictions, former legal decisions and other authoritative statements, Supreme Court decisions in particular, are relevant sources for assessing the law. A former decision, however, is just the application of law on the facts in an earlier case. The question is, then, to what extent the factual circumstances of this former case should be turned into case law.

The choice between rules and standards and the choice of the level of precision of rules are topics that are suitable to be studied by decision theory according to the rationality

¹²² A broad and interdisciplinary survey of the use of forensic evidence can be found in Reference Manual on Scientific Evidence published by Federal Judicial Center (2000).

¹²³ See Schinkel (2008) for a survey of the use of forensic economics in competition law analysis.

criteria. These are topics that will be discussed in Chapter Four. When the rule is decided, the assessment of facts can be studied by evidence-based decision theory according to the rationality criteria. This will be discussed in Chapter Five.

Since model based-inference, and, in particular, the use of economic models is so important in antitrust analysis, Chapter Six is devoted to rationality in the assessment of economic models in antitrust analysis.

The remainder of this chapter comprises a description of the theory of rational decisions and how this theory is to be applied to yield a rational antitrust analysis. The relation between rational antitrust analysis and actual antitrust analysis is briefly discussed. This will serve as an introduction to the theory that will guide the assessment of rationality of antitrust analysis in the remainder of this study. It will also offer grounds for a conclusion as to whether rationality can and should guide antitrust analysis.

3.3 What is a rational antitrust analysis?

3.3.1 Antitrust analysis and the assumptions of rationality

The framework for rational decision making

Antitrust analysis can be considered rational if it is performed as it would have been performed by a rational decision maker. A rational decision means that the decision maker follows some basic principles that are considered rational. In a world of risk and uncertainty,¹²⁴ this includes adapting to uncertainty in a rational way. For the purposes of this study, it is not necessary to dig deep into the details of the mathematical axioms of rational behavior. Nevertheless, some description is necessary. For a decision to be rational, it must be in accordance with some axioms. Axioms are premises that cannot be deductively proved and can be considered as basic assumptions that must be assessed on their reasonableness and empirical support alone. Today's axiomatic approach to decision theory is based on, inter alia, Ramsey (1931), de Finetti (1937), von Neumann and Morgenstern (1944), and Savage (1954).¹²⁵ Before discussing the axioms, the framework the axioms of rationality are assumed to operate within is briefly described.

¹²⁴ Some decision theory texts distinguish between risk and uncertainty originating from Knight (1921). Decision under risk is reserved to those situations where probabilities are available and the term uncertainty is reserved for the situations when probabilities are not available. The latter is also referred to as decisions under ignorance. Uncertainty is, by others, applied as a term covering both risk and ignorance. In this study, uncertainty and risk will be used interchangeable. See Binmore (2009) p 35 f. and Peterson (2009) p. 4 f.

¹²⁵ Parmigiani and Inoue (2009) p. 11 f. describes the axioms of rationality systematically and in more detail and has served as inspiration for the description in this text. See also Gilboa (2009) p. 49 f., Hargreaves-Heap and Varoufakis (2004) p. 8 and Varian (1992) p. 95 f and 173 f.

For simplicity, discrete variables will be used to illustrate the framework for rational decisions. The framework for real world decisions, like the decision on how much to eat or what price to charge, is often continuous. This study mostly operates with discrete decisions, such as deciding violation or non-violation of the antitrust laws. The framework described can easily be adapted to a continuous framework, and the same principles will apply.

The framework for discrete rational decisions assumes that there are m possible actions a_1, a_2, \dots, a_m . The decision is about choosing between those possible actions. The outcome of an action depends on the state of the world. The realization of the different states of the world can be assigned a probability. Thus, there is a risk involved. The possible states of the world are assumed to be R_1, R_2, \dots, R_n , and they occur with respective probabilities p_1, p_2, \dots, p_n , where $p_1 = p(R_1)$, $p_2 = p(R_2)$, ..., $p_n = p(R_n)$. The different actions might have different outcomes under different states of the world. A typical example to illustrate decision under risk is that carrying an umbrella has different consequences under different weather conditions. It is a hassle to carry in nice weather, but a blessing in bad weather. In this simple example, a_1 can be interpreted as leaving the umbrella home, while a_2 is bringing it. R_1 is the state of nice weather, while R_2 is the state of bad weather.

The probabilities of the different states of the world must satisfy the axioms of probability derived by Kolmogorov (1950)¹²⁶. The axioms of probability can briefly be described as follows.¹²⁷ Assume that $R_1, R_2, R_3, \dots, R_n$ are mutually exclusive states and include all possible states. Then

$p(R_i) \geq 0$	the probability of a state must be equal or larger than zero
$p(R_i \cup R_j) = p(R_i) + p(R_j)$	the probability of at least one of two mutually exclusive states is the sum of their probabilities ($i \neq j$)
$\sum_i p(R_i) = 1$	the probability that at least one of all possible states occurs is one

¹²⁶ Published in German in 1933. There are other axiomatic systems that represent uncertainty, see for instance Halpern (2003) p. 11 f. For example is it possible to build an axiomatic system not based on exact probability measures but on relative terms such as "A is more probable than B" without specifying the exact probabilities for A and B. However, the mainstream decision theory is based on the Kolmogorov axiomatic system. Decision theories based of other representations of uncertainty has not been developed to a stage that makes it practically suitable to be used as a basis for this study. The issue of rational decision rules when exact probabilities are not available will be returned to below.

¹²⁷ See for instance Wasserman (2003) p. 3 f. for a more detailed description of the axioms of probabilities.

Let us now say that two events, A and B, are not mutually exclusive. For instance, let $A=\{R_1,\dots,R_k\}$ and $B=\{R_k,\dots,R_n\}$. A and B have R_k in common. If the state R_k is realized, then both A and B will be realized. It can be derived from the axioms that

$$P(A\cup B)=p(A)+p(B)-p(A\cap B)$$

$p(A\cap B)$ is the probability that both A and B are realized simultaneously. This rule is intuitive. If $p(A\cap B)$ is not deducted from the sum of the probabilities of A and B, it would be counted twice. Thus, one of them must be deducted. In our example, $p(A\cap B)=R_k$ and is included two times in $p(A)+p(B)$. Thus, in the probability of either A or B, which is $P(A\cup B)$, $p(A\cap B)=R_k$, must be deducted from $p(A)+p(B)$.

The probability of an event, A, given another event, B, is defined as

$$P(A|B)=p(A\cap B)/p(B)$$

This is intuitive since the probability that A happens given that B happens is the share of possible states in which both A and B happen as a share of all the possible states in which B happens.

Furthermore, two events are independent if $p(A|B)=p(A)$. This is also intuitive. If A and B are independent, then the knowledge of B does not give information on the probability of A. Independence implies that $p(A\cap B)=p(A)p(B)$ given the definition of conditional probabilities above.

The framework for rational decisions also assumes that a person's assessment of the outcome of an action must be state-independent. This means that the preference of the alternative actions in different states can be assessed before taking the decision and is independent of which action was actually taken. If the preference of an action is not known before making it, it is difficult to make a rational decision. This assumption means that the decision itself cannot affect the desirability of that decision. It would be meaningless to assess rational decisions if a decision is preferred because it is taken. If you prefer an apple in the choice between an apple and orange because the apple was what you chose, it is impossible to

meaningfully assess what the rational choice should be before the choice is made. It might be that this assumption conflicts with reality. Cognitive biases may, in practice, work in such a way that people, after a choice is made, become more convinced that the choice actually taken was the right one. Cognitive biases will be discussed below. However, for a normative ex ante assessment of what decision is rational, it would be difficult to take into account that an action is preferred because it was chosen. In the extreme, that would make any choice rational.

The basic axioms for rational decisions under risk and uncertainty

Now the framework for rational decision making is established, and the axioms of rational behavior can be returned to.

The completeness axiom of rationality requires that all possible actions can be ranked against each other, and that the decision maker takes all alternatives into account when deciding. The reasonableness of this assumption can be questioned. How often are all possible alternatives known when making a decision? However, at least for small delineated decisions problems, this axiom seems reasonable. In an antitrust analysis context, the completeness axiom of rationality means that the decision maker must be able to rank all possible antitrust decisions in a given case.

Transitivity is another basic axiom. Transitivity means that the decision maker is consistent in the ranking of alternatives. In other words, if a_1 is preferred to a_2 , and a_2 is preferred to a_3 , then a_1 is preferred to a_3 .¹²⁸ Transitivity is important. We could earn infinite money exploiting a person that violates this principle in his preferences. Assume that Peter prefers apples to bananas and bananas to oranges. Transitivity means that Peter prefers apples to oranges. Assume, otherwise, that oranges are preferred to apples. Assume that Peter holds a banana. Then, we could sell him an apple for the banana and some additional money. Peter then possesses an apple. We would possess the banana and the additional money. We could then sell him an orange for the apple and some additional money. Now, Peter possesses the orange, which he would exchange for the banana we hold and some additional money. We are back to the start, only we are richer and Peter is poorer. We could repeat these transactions and get infinite rich (assuming an infinitely rich Peter). In an antitrust analysis context, the transitivity axiom means that if a_1 to a_3 are possible antitrust decisions and a_1 is preferred to a_2 and a_2 is preferred to a_3 , then a_1 is preferred to a_3 .

¹²⁸ In mathematical terms this means that if $a_1 \succ a_2$ and $a_2 \succ a_3$, then $a_1 \succ a_3$.

Another axiom is the axiom of independence of irrelevant alternatives. This axiom assumes that if a_1 is preferred to a_2 , then choosing a_1 with probability α and a third action, a_3 , with probability $1-\alpha$, is preferred to choosing a_2 with probability α , and the third action a_3 with probability $1-\alpha$. Briefly: if a_1 is preferred to a_2 , then $\alpha a_1 + (1-\alpha)a_3$ is preferred to $\alpha a_2 + (1-\alpha)a_3$ for $0 < \alpha \leq 1$.¹²⁹ This axiom of independence ensures that two decisions can be compared only on those components that make them different.

Below possible reasons why the axiom of independence of irrelevant alternatives is violated in practice are discussed. However, it seems reasonable to assume that if a third alternative is truly irrelevant in the choice between two decisions alternatives it would be rational to not take this irrelevant alternative into account in a lottery involving the possibility of this third alternative. If, for instance, the action of choosing an apple is preferred to the action of choosing an orange and there is a possible third action involving not getting anything at all, then introducing the possibility of a positive probability of getting nothing at all does not change the ranking between the apple and the orange. In antitrust, this means that if two decisions are ranked in a particular order then introducing the possibility of a third decision does not change the ranking of the two. If, for instance, ordering “cease and desist” is preferred to an approval decision, then introducing the possibility of a third decision, let us say some kind of approval with commitments decision, does not change the ranking between the “cease and desist” order and the approval. However, this relies on the assumption that a commitment decision is an irrelevant alternative, which it might not be from a legal perspective. Introducing a possibility of commitment might be argued to change the ranking between “cease and desist” and approval because imposing commitments is a possible alternative. The legal argument would be that the possibility of commitments is more likely to make a “cease and desist” order less proportional. This might be true, but if this is the case then the actions available are not really “cease and desist” and approval, but “cease and desist” and approval, given that a commitment decision is possible. The possibility of commitments is then no longer an irrelevant alternative. Thus, this would not be a criticism of the axiom of independence of irrelevant alternatives, but a criticism against considering commitment as an independent alternative.

The Archimedean axiom assumes that if a_1 is preferred to a_3 , and a_3 is preferred to a_2 , which means that a_3 is ranked between a_1 and a_2 , then there exist lotteries that mix a_1 and a_2 , that are both worse and better than a_3 . That means that there exist an $0 < \alpha < 1$ and a $0 < \beta < 1$ such

¹²⁹ Or, in shorter terms: if $a_1 > a_2$, then $\alpha a_1 + (1-\alpha)a_3 > \alpha a_2 + (1-\alpha)a_3$ for $0 < \alpha \leq 1$.

that $\alpha a_1 + (1-\alpha)a_2$ is preferred to a_3 , and a_3 is preferred to $\beta a_1 + (1-\beta)a_2$.¹³⁰ This means, simplified, that no action is so bad or good that, no matter how small its probability, it will “dominate” the preference order. The Archimedean axiom is also referred to as the axiom of continuity. It is easy to see that this axiom could likely be violated in some circumstances. Let say that choosing an apple is preferred to choosing an orange, and they are both better than an action involving a certain death. The Archimedean axiom implies that there exists some lottery involving a positive probability of an apple and a positive probability (although small) of the action involving a certain death that is still better than the orange. Some would probably violate this axiom by choosing the orange action no matter how small the possibility of death is, as long as it is positive. The minimal extra benefit of getting the more preferred apple is not worth the risk of death, no matter how small this risk is. The Archimedean axiom is more of a technical nature needed for some of the implications of the theory of rational decisions (discussed further below). However, as long as we operate in delineated decision situations not involving possible actions with extreme “downturns”, the satisfaction of the axiom is probably a harmless assumption. In the delineated framework of antitrust analysis, there are normally no available actions involving extreme “downturns” that will dominate any decisions involving the possibility of this “downturn”. Thus, the satisfaction of the Archimedean axiom seems to be a harmless assumption for rationality in the context of antitrust analysis.

Axioms of rational decisions when probabilities are subjective

So far, the probabilities for the different states of the world have been assumed to be objective. This means that the probabilities of the different states of the world have been considered to be objective and equal for all decision makers. What if there are no objective probabilities for the different states, but only a person’s own more or less qualified subjective probability assessments? Subjective assessments might differ from person to person. You will probably not have the exact same assessment of the probability of nice weather tomorrow as the person in your neighboring office. Similarly, in an antitrust analysis context, one person’s assessment of the probability of harmfulness of some conduct might differ substantially from another person’s assessment. Is it possible to construct some plausible axioms of rationality taking into account that different decision makers only have subjective assessments of the

¹³⁰ In mathematical terms: if $a_1 \succ a_3$ and $a_1 \succ a_3 \succ a_2$, then there exist an $0 < \alpha < 1$ and a $0 < \beta < 1$ such that $\alpha a_1 + (1-\alpha)a_2 \succ a_3$ and $a_3 \succ \beta a_1 + (1-\beta)a_2$.

probabilities of the different states? Ramsey (1931), de Finetti (1937), and Savage (1954) explored and developed such axioms.

Savage's approach is the usual foundation for today's analysis of rational decisions under uncertainty. Savage constructed some axioms for rational behavior under such subjective probability beliefs. It is rather complicated to go through Savage's axioms, and this is beyond the scope of this study. They are partly modifications and further developments of the above stated axioms based on Von Neumann and Morgenstern (1944). The mathematics involved will not be presented here.¹³¹ Nevertheless, some can be said about the requirement for rationality under subjective probability assessments.

For decisions to be considered rational under subjective probability assessment, it is assumed that a rational decision maker is coherent concerning his subjective beliefs of the probabilities. The requirement of coherence was pointed out by de Finetti (1937). Coherence means that the subjective beliefs satisfy the basic laws of probability stated above. Coherence of subjective probabilistic assessment seems to be a reasonable assumption on rational decision making under uncertainty. A consequence of lack of coherence can be illustrated by so-called Dutch Books. A bookmaker must avoid Dutch Books to prevent a player to exploit incoherence to earn an infinite amount of money. To simplify, let us say that the betting is on a horse race game involving only two horses. The player can play on which horse will win. Let say that the bookmaker offers the following odds 1:4 and 7:3 on horse 1 and horse 2, respectively.¹³² This means that he takes the price 0.2 to pay out 1 if horse one wins according to the first bet. In the second bet, he takes the price 0.7 to pay out 1 if horse 2 wins. The player could bet on horse 1 in the first bet and horse 2 in the second bet. This would cost 0.9 and give a sure payment of 1. The bets that guarantee a sure payoff can be illustrated by a matrix:

Figure 3.1: betting on a horse raise game

	Payoff if horse 1 wins	Payoff if horse 2 wins
Bet 1	0.8	-0.2
Bet 2	-0.7	0.3
Sum (gain)	0.1	0.1

Thus, the player can construct a sure win by betting on horse 1 in the first bet and betting on horse 2 in the second bet. The reason for this is incoherence. In the first bet, the bookmaker

¹³¹ See for instance Parmigani and Inoue (2009) p. 81 f.

¹³² The numerical example is based on Parmigani and Inoue (2009) p. 17

indirectly assigns a probability of 0.2 to that horse 1 wins, while in the second bet the bookmaker assigns a probability of 0.3 that horse 1 wins. The player can exploit this to a sure win. In antitrust analysis, coherence means the antitrust decision maker must be coherent in his assessment of probabilities. If the decision maker, for instance, believes that the probability that some conduct has anticompetitive effects is 60 percent, then the probability that the same conduct does not has anticompetitive effects must be 40 percent.

Another crucial aspect of rationality in the presence of subjective probability assessments is that the decision maker updates his belief according to the correct rules of probability. In fact, this follows from the assumption of coherence since if the decision maker does not update his beliefs according to the rules of probability the resulting probabilities will not be coherent. This means that the decision maker must update according to Bayes' rule when the decision maker receives information relevant for assessing the probability. Assume e is a piece of evidence received before making a decision. From the definitions of probability above, remember that $p(A|e) = P(A \cap e) / P(e)$. Using this rule one more time, which means using $p(e|A) = p(A \cap e) / p(A)$, gives us $p(A|e) = p(e|A)p(A) / P(e)$. The last equation is Bayes' rule and shows how evidence should update the probability assessment of A according to the rules of probability. In antitrust analysis, this means that evidence must be assessed according to the rules of probability to reach rational antitrust decisions.

Axioms of rationality and rational antitrust decisions

Rational antitrust analysis is the analysis made by a rational decision maker to obtain a rational antitrust decision. This means that the antitrust decision must satisfy the basic axioms of rationality described above. However, instead of trying to apply the axioms directly on antitrust decisions, it is better to apply the principle of maximization of expected utility which is equivalent to adhering to the axioms stated above. This will be the topic in the following subchapter.

3.3.2 Expected utility maximization and rational antitrust analysis

Rationality and expected utility maximization

von Neumann and Morgenstern (1944) showed that if preferences satisfy the rationality axioms outlined above, this is the same as if preferences can be represented by a utility function and the rational choice is the choice that maximizes expected utility. This means that if a_1 is preferred to a_2 , then there is a utility function $U(\cdot)$ such that $U(a_1) \geq U(a_2)$ with strict

inequality if a_1 is strictly preferred to a_2 .¹³³ Furthermore, the correct utility measure of some action where the outcome is uncertain is the expected utility. This means, for instance, that if action a_1 either generates utility $U_1(a_1)$ with probability p_1 or utility $U_2(a_1)$ with probability $p_2=1-p_1$, then the correct utility measure of action a_1 is the expected utility given by $p_1U_1(a_1)+p_2U_2(a_1)$.

Thus, a rational decision under uncertainty can be modeled as the decision that maximizes expected utility. An intuitive explanation for this is that a decision that maximizes expected utility gives the highest utility in the long run.¹³⁴ The proof in von Neumann and Morgenstern (1944) was based on objective probabilities. Savage (1954) showed that the same applies under subjective probabilities satisfying the assumptions discussed above.

If $U_i(a_k)$ is the utility of action k , given that the state of the world is i and the probability that the world will be in state i is p_i , the expected utility of deciding action k can be written as

$$EU(a_k)=\sum_i p_i U_i(a_k).$$

The rational decision is the one that makes $EU(a_k)$ highest. This can be written as

$$d^*=\arg \max_k EU(a_k).$$

The next question that arises is how to derive and measure the probabilities and the utility measures necessary to make a rational decision. For now, we can think of the probabilities as given and the utility as some measure that makes it possible to cardinaly rank decision alternatives quantitatively. Before elaborating on the problem of deriving and measuring probabilities and utilities, the principle of maximization of utility applied to antitrust analysis is described.

Expected utility maximization in antitrust analysis

In the legal context of antitrust analysis, one can think of two major mutually exclusive decisions resulting from the antitrust analysis. These two decisions are either that the law is violated or not violated. In reality, there is a variety of possible antitrust decisions, and even a continuum of possible decisions. If a decision involves an establishment of violation and the

¹³³ In other words: if $a_1 \succcurlyeq a_2$ then $U(a_1) \geq U(a_2)$ and if $a_1 \succ a_2$ then $U(a_1) > U(a_2)$.

¹³⁴ This intuition, however, will be of little help in unique decision problems that are not repeated.

setting of a fine, the continuum of possible sizes of the fine creates a continuum of possible decisions. Furthermore, a settlement, possibly including commitments, is a possible alternative to deciding violation. A decision of not violation may also be imprecise and involve many decisions. This involves explicit statements that there was not a violation, as well as statements that a violation is not proven according to the standard of proof. However, for simplicity, this study will illustrate the rational antitrust decision by assuming two mutually exclusive decisions: violation and not violation. The principles are the same with a wider range of possible decisions. Thus, the decision framework can be written as

a_V : deciding violation of law

a_{NV} : deciding that the law is not violated

The corresponding utilities are

$U_V(a_V)$: utility of deciding violation of law given that the law was violated

$U_{NV}(a_V)$: utility of deciding violation given that the law was not violated

$U_V(a_{NV})$: utility of deciding not violation of law given that the law was violated

$U_{NV}(a_{NV})$: utility of deciding not violation given that the law was not violated

and, finally

p_V : probability that the law was violated

p_{NV} : probability that the law was not violated

The uncertainty for the decision maker is that he does not know for sure if the law was violated or not. However, p_V is the probability that the law was violated and $p_{NV}=1-p_V$ is the probability that the law was not violated. For now, those probabilities are given. Later, however, the analysis will take into account evidence gathering and that the probability of

violation will be affected by the assessment of evidence. Deciding violation is rational if $EU(a_V) > EU(a_{NV})$.¹³⁵

3.3.3 From expected utility maximization to expected loss minimization

Expected utility maximization is the normal way to represent rational decisions. However, in many contexts, and in particular legal contexts expected loss minimization, also figures as a decision rule. Maximizing expected utility and minimizing expected loss is the same principle, although minimization of the expected loss of wrongful decisions sometimes has a more intuitive appeal, especially in the legal context. Since this study will mostly operate with the minimization of expected loss as the rational decision rule, it will be described how the maximization of expected utility decision rule can easily be transformed into a minimizing expected loss decision rule. Following the algebra above, $EU(a_V) > EU(a_{NV})$ is the same as

$$p_V U_V(a_V) + (1-p_V) U_{NV}(a_V) > p_V U_V(a_{NV}) + (1-p_V) U_{NV}(a_{NV}).$$

Manipulating this inequality gives

$$p_V [U_V(a_V) - U_V(a_{NV})] > (1-p_V) [U_{NV}(a_{NV}) - U_{NV}(a_V)].$$

This can be written as

$$p_V L_{NV} > (1-p_V) L_V,$$

where

$L_V = U_{NV}(a_{NV}) - U_{NV}(a_V)$ is the loss of wrongfully making the decision that the law was violated, a_V . This is the forgone utility of making the right decision of non-violation minus the utility of making the wrong decision as such. If it is decided that the law was violated, the probability of this error is $(1-p_V)$. This error is called a type-1

¹³⁵ Strictly speaking deciding violation will be rational if and only if $EU(a_V) \geq EU(a_{NV})$. However we will operate with the assumption that if the expected utility of deciding violation and not violation is equal, then deciding not violation is decided.

error, which, in legal terms, means wrongful conviction.¹³⁶

$$L_{NV}=U_V(a_V)-U_V(a_{NV})$$

is the loss of wrongfully deciding that the law was not violated, d_{NV} . This is the forgone utility of making the right decision of violation minus the utility of making the wrong decision as such. If it is decided that the law was not violated, the probability of this error is p_V . This error is called type-2 error, which, in legal terms, means a wrongful acquittal.¹³⁷

Thus, the rational decision problem boils down to minimizing the expected loss of a wrongful decision. Violation of law should be decided if $EL_V < EL_{NV}$, which is when $(1-p_V)L_V < p_V L_{NV}$. The expected loss, given that the decision that minimizes expected loss is made, is then

$$EL = \min[(1-p_V)L_V, p_V L_{NV}].$$

This result is quite amazing. All we need to do to make a rational decision is to choose the action that minimizes expected loss. It is then of course assumed that the assessments of probabilities are coherent. It might be rational to make a decision based on less probable facts if the loss of a wrongful decision is less than the loss of a wrongful decision based the more probable facts. Another way to say this is that the higher the loss associated with a wrongful decision in one direction the more certain we must be that the facts favor this decision.¹³⁸ This is the scientific basis for the well-known rule of “erring on the right side”. The expected loss from type-1 error must be compared to the expected loss of type-2 error, and the alternative with the lowest expected loss should be chosen.

¹³⁶ In statistics a type 1-error is to wrongfully reject a hypothesis. Transferred to the legal environment this means wrongfully reject a hypothesis of innocence.

¹³⁷ In statistics a type 2-error is to wrongfully accept a hypothesis. Transferred to the legal environment this means wrongfully accept a hypothesis of innocence.

¹³⁸ $(1-p_V)L_V < p_V L_{NV}$ is the same as $(1-p_V)/p_V < L_{NV}/L_V$, which becomes $p_V/(1-p_V) > L_V/L_{NV}$. Thus, if, for instance, the loss of wrongfully deciding violations is 10 times higher than wrongfully deciding not violation, then the probability of deciding violation must be more than 10 times higher than the probability for not violation for it to be rational to decide violation.

3.4 Expected loss minimization in antitrust analysis

3.4.1 Rational determination of antitrust rules

Now we can start to approach decision problems relevant for the various components of antitrust analysis. Before it is possible to decide violation or not violation, the rule that is either violated and not violated must be determined. Assume we are deciding between what kind of rule is best for making rational antitrust decisions: rule 1 or rule 2. The costs associated with the formulation and the application of the alternative two rules are C_1 and C_2 , respectively. Let ELR_1 and ELR_2 be the expected loss of the two rules respectively. This is the accumulated type-1 and type-2 errors that is associated with the application of the alternative rules.¹³⁹ Then, rule 1 is preferred to rule 2 if

$$ELR_1 + C_1 < ELR_2 + C_2.$$

Thus, two factors are relevant for deciding between rules: the expected loss and the formulation and application cost. The expected loss of a rule is dependent on both the type-1 errors and type-2 errors associated with the rule. Both losses must be taken into account. A rule associated with higher expected losses can be tolerated if formulation and application costs are sufficiently lower.¹⁴⁰ The application of this principle in the determination of rational antitrust rules will be the main topic in Chapter Four.

3.4.2 Expected loss minimization and evidence assessment

The rule is now taken as given. The question then becomes how to minimize expected losses of an antitrust decision taking into account the possibility of gathering evidence that can be used to update the probability assessments as to whether there was a violation or not.

Assume that \bar{E} is the evidence that is gathered. \bar{E} is a subset of the potential amount of evidence, \bar{E}^{tot} . The outcome of gathering \bar{E} is unknown before it is observed. If we, for instance, search for some communication in an antitrust conspiracy case, we might not find such evidence. Both finding and not finding such evidence are outcomes of \bar{E} . Assume that e is the outcome of gathering evidence \bar{E} . If e is the outcome of \bar{E} , then the probability of

¹³⁹ This could have been modeled mathematically by using a model of how often the errors are likely to occur. A proper model would involve more advanced calculus. This will not be necessary for the general level of analysis performed here.

¹⁴⁰ Kaplow (1992) and Kaplow (2000) study the optimal design of rules in general. Posner (2011), Chapter 20, covers, inter alia, rules versus standards. Easterbrook (1984), Becker and Salop (1999) and Christensen et al. (2006) study the optimal design of antitrust rules. This literature will be scrutinized in detail in Chapter Four below.

violation updates to become $p_V(e)$. $p_V(\bar{E})$ is the ex-ante probability of violation if \bar{E} is gathered, which is stochastic before we know what e actually materializes.

The value of gathering evidence is how much it reduces the expected loss of the decision. Assume that EL is the expected loss of an optimal decision when not gathering evidence \bar{E} , and $EL(\bar{E})$ is the expected loss when gathering evidence \bar{E} . This means that

$$EL(\bar{E}) = \min[(1-p_V(\bar{E}))L_V, p_V(\bar{E})L_{NV}].$$

The value of gathering evidence, \bar{E} , can then be measured as $EL - EL(\bar{E})$, which is the decision value of gathering evidence.¹⁴¹ It can be shown that a priori, taking into account free evidence will always reduce the expected loss of a decision.¹⁴²

Evidence is often costly to gather and assess. These costs can be described by a cost function, $c(\bar{E})$. Economic considerations should guide the evidence gathering process. Both what evidence should be gathered and the sequence in which the evidence is gathered should be subject to economic scrutiny. The rational gathering of evidence can be described as

$$\text{Min}_{\bar{E}} E_{\bar{E}}(EL(\bar{E}) + c(\bar{E})).$$

Since $EL(\bar{E})$ is equal to $\min[1-p_V(\bar{E}))L_V, p_V(\bar{E})L_{NV}]$, this becomes

$$\text{Min}_{\bar{E}} E_{\bar{E}}([\min(1-p_V(\bar{E}))L_V, p_V(\bar{E})L_{NV}] + c(\bar{E})).$$

The idea behind the formula above is simple, though it might appear complicated. There are two minimization operations. Given that some evidence, e , is gathered, the rational decision maker will minimize expected loss. This means deciding a_V if $(1-p_V(e))L_V < p_V(e)L_{NV}$, and a_{NV} otherwise. However, before the evidence is gathered, the rational decision maker has to “average” over all possible outcomes of \bar{E} by taking the expectation when deciding to gather the evidence or not. This is the $E_{\bar{E}}$ part. The $\text{Min}_{\bar{E}}$ refers to the decision maker having to optimize the evidence gathering taking the cost of gathering evidence into account. The evidence gathering must be optimized with both regard to the amount of evidence and the sequence by which evidence is gathered. The question is whether the decision value of gathering some evidence exceeds the cost. As said by Beckner and Salop (1999): “*the court*

¹⁴¹ See Parmigani and Inoue (2009) p. 259 f. for a survey of the literature.

¹⁴² Raiffa and Schlaifer (1961).

first should gather information that is least expensive, resolves the most certainty, and is most likely to affect its decision". Dynamic programming can, in principle, be used to solve the optimization problem. In practice, we have to rely on heuristic methods and a dialectical process of competing agents presenting evidence that benefits their case. This will be elaborated further upon in Chapter Five.^{143,144}

3.4.3 Expected loss minimization and model-based inferences

Implicitly we always use models when analyzing a decision problem. A model says something about the structural links and connection between variables, including causality. In models, some explanatory variables are usually used to explain a response variable. In antitrust analysis, market structure, for example, is used in some models to explain a firm's pricing. In some economic competition models, it is a sure consequence that an increase in market concentration results in increased prices.¹⁴⁵ Models can be more or less informative based on their power to explain and predict. Decisions can be improved by explicitly taking into account the uncertainty associated with the models used in the decision making. Let $p_V(e|M)$ be the probability of violation given evidence e and that model M is "true", and $p(M)$ the probability that model M is the "true" model.¹⁴⁶

When taking the uncertainty of the models into account, the decision problem can be described as

$$\text{Min}_E E_E(\min[E_M(1-p_V(\bar{E}|M))L_V, E_M p_V(\bar{E}|M)L_{NV}] + c(\bar{E})),$$

where

$$E_M(1-p_V(\bar{E}|M))L_V = \sum_M (1-p_V(\bar{E}|M))p(M)L_V \text{ and } E_M p_V(\bar{E}|M)L_{NV} = \sum_M p_V(\bar{E}|M)p(M)L_{NV}.$$

¹⁴³ See Parmigani and Inoue (2009) p 221 f. for a general framework on how this maximization problem can be solved. Posner (2011), Chapter 22, gives a general law and economics approach. Beckner and Salop (1999), Kerber et al. (2008). and Kretschmer (2011b) use this approach in antitrust contexts. The theory will be described in more detail in Chapter Five.

¹⁴⁴ With a prefixed standard of proof set to be α , the evidence assessment becomes a restrained maximization problem as follows: Minimize $E_E((1-p_V(\bar{E}))L_V I(p_V(\bar{E}) > \alpha) + p_V(\bar{E})L_{NV} I(p_V(\bar{E}) \leq \alpha) + c(\bar{E}))$ where $I(p_V(e) > \alpha) = 1$ if $p_V(e) > \alpha$ and 0 else, and $I(p_V(e) \leq \alpha) = 1$ if $p_V(e) \leq \alpha$ and 0 else. This is more realistic in the legal context as the standard of is given exogenously dependently on the type of the case. This maximization problem will be discussed further below in Chapter Five.

¹⁴⁵ This will, for instance, apply under so-called Cournot quantity competition, where an increased concentration is not associated with lower marginal costs. Economic models will be described further in Chapter Six.

¹⁴⁶ Note that models might also be involved in the assessment of the losses L_V and L_{NV} . Incorporating model uncertainty in the assessment of such losses raises issues of state dependence, which substantially complicates the analysis. The choice of model will then affect the utility and losses. Thus, it is chosen not to introduce this complication in this study. Rather, it is assumed that the consequence of model uncertainty is fully captured in the model dependent probabilities.

Thus, a rational assessment involves giving weight to the model-based inferences based on the model probabilities. $E_M(x)$ is the expected value of x , where the x 's "predicted" by the various models are "averaged" over all models weighted according to their probability. The explicit assessment of model uncertainty is essential for rational model-based inferences in decision making. This is particularly relevant when it comes to antitrust analysis because the use of economic models has an important role for inferences in antitrust analysis. Rationality in the assessment of economic models is discussed further in Chapter Six.

3.5 How to deal with unavailable and subjective probabilities

In the decision-theoretic analysis of antitrust analysis presented above, it was assumed that the probability of violation was available. This raises two questions regarding the application of decision theory to antitrust analysis. Firstly, what shall we do if we don't have any precise probabilities? Can the theory of rational decisions based on the availability of precise probabilities still be useful or must the rational decisions be based on other principles? Secondly, are there any objective probability measures? Can there be any objective rational antitrust decisions if the probabilities are subjective? These questions are dealt with in turn in this subchapter.

3.5.1 The absence of precise probabilities

Savage (1954) stressed that his analysis only applies to "small worlds" (i.e. delineated environments). In "big worlds" the available actions, the possible states of the world or at least the probabilities of the different states of the world and the consequences of actions are unknown. In the assessment of evidence, the amount of potential evidence and the a priori impact of evidence on probabilities violation may be unknown. A decision rule based on maximization of expected utility assuming the presence of precise probabilities may simply not be an available method of making decisions. A comprehensive and debated question is how rational decisions should be made under such circumstances.

Principles for rational decisions under ignorance, which means decisions when precise probabilities are not available, have been proposed.¹⁴⁷ Some principles are obvious and some are less obvious. One obvious principle is the principle of dominance. If there, for instance, is a dominating action, which is an action that is sure to give a better outcome whatever state of the world, it is rational to decide upon this action. Conversely, an action that is dominated,

¹⁴⁷ See for instance Halpern (2003) p. 166 f., Parmigani and Inoue (2009) p. 112 f. and Bermúdez (2009) p. 25.

which is an action associated with a worse outcome than another available action no matter the state, should not be decided. If we know, for instance, that the outcome of deciding not violation will yield a better outcome even if we could say with certainty that there actually was a violation, then deciding not violation is apparently rational. This principle does not seem to be sufficient as a general decision rule as the presence of dominating actions is probably more the exception than the rule, except for those who are general opponents of antitrust law and always would want to decide not violation.

An optimal decision can usually not be picked from the dominance criterion alone. Another candidate for a decision principle under ignorance is the minimax principle. The minimax principle is very conservative and means to choose the action that minimize the maximal possible loss whatever the state. If, for instance, the loss of wrongfully deciding violation is bigger than wrongfully deciding not violation, and there is some chance of wrongfully deciding violation, then we should decide not violation. If the minimax principle governed the decision, there would be no need to gather evidence. We just have to look for the action with the least error in case of wrongful decision and decide upon this decision. As with the dominance criterion, this rule doesn't seem to be very practicable as a general rule

A third possible candidate decision principle is the minimum regret principle. According to this principle, we should choose whatever decision we would regret least if we were wrong. If, for instance, we would regret more if we decided violation when there actually had not been any violation than deciding not violation and then there actually had been a violation, we should decide not violation. In this context, where the loss of making a wrong decision is the potential for regret, the minimax and minimum regret principles coincide. This means that the minimum regret decision principle would be impracticable for the same reasons as stated for the minimax principle above. It can be mentioned that experiments¹⁴⁸ seem to indicate that the minimum regret principle has some merits in descriptive decision theory, and therefore cannot be ignored in the study of actual decision making.

Several models of generalized expected utility decision making have been developed.¹⁴⁹ These are based on decision theories that relax the reliance of the axioms stated above. These modifications have at least two purposes. One purpose is to create decision theories more in line with actual decision making. Those modifications might improve the

¹⁴⁸ See references and discussion in the in section on descriptive decision theories below.

¹⁴⁹ See Halpern (2003) p. 164 f.

decision theories in terms of explaining and predicting actual behavior.¹⁵⁰ Descriptive decision theories take into account how people actually make decisions subject to, *inter alia*, cognitive biases.¹⁵¹ Such theories include prospect theory,¹⁵² Choquet expected utility theory,¹⁵³ and maxmin expected utility theory¹⁵⁴. These theories are not necessarily very useful as normative theories of rational decision making. A theory that might explain any decision as “rational” would not be a very useful guide what rational decisions are. Descriptive decision theory will be addressed further below.

Another task for general expected utility decision models is to base the models on axiomatic principles of representing uncertainty other than the availability of precise probabilities.¹⁵⁵ Our uncertainty representation could, for instance, be limited to a belief that violation is more probable than non-violation. The uncertainty representation could alternatively, for instance, be some belief that the probability of not violation is less than 30 percent and that the corresponding probability of violation is larger than 70 percent. This is a promising field of research. A good normative theory of rational decision based on more imprecise representations of uncertainty would be very welcomed to be further developed into a method that is operational for a normative model of legal decision making, as more vague representations of uncertainty are more in line with the nature of legal decisions. However, such models are, to the author’s knowledge, not explored to a point where they are easy to apply in the context of legal decision making. This requires further research. Incorporating such theories into this study would mean contributing to this field of research, which is beyond both scope and aim of this study.

Being left with a normative theory based on the presence of precise probabilities, the question then becomes whether this is such a strong assumption that it is useless as a normative theory for antitrust analysis. This would also mean that a large amount of existing research based on those assumptions, such as a substantial part of the law and economics research, would be effectively useless. There have been such allegations.¹⁵⁶ Such allegation will not stop this study to be based on the theory of rationality assuming the presence of precise probabilities. Although a theory based on the presence of precise probabilities might work poorly as an operational guide to finding the specific rational decision in an actual case,

¹⁵⁰ See for instance Gilboa (2009) p. 145 f. for a description of such behaviorally based decision theories.

¹⁵¹ See Gilboa (2009) p. 145 f.

¹⁵² See Gilboa (2009) p. 154 f. Developed by Tversky and Kahneman (1992).

¹⁵³ See Gilboa (2009) p. 145 f. Based on Schmeidler (1989).

¹⁵⁴ See Gilboa (2009) p. 160 f. Based on Schmeidler (1989).

¹⁵⁵ See Halpern (2003) p. 11 f. and p. 164 f.

¹⁵⁶ See, for instance, Allen (2003) and Stein (2011).

the theory is still useful as a normative benchmark. A chief question of this study is whether the antitrust assessment principles and procedures are likely to facilitate rational decisions. If the antitrust assessment principles and procedures work well, they will facilitate decisions that converge towards rational decisions even where no one involved in the decision making procedure actually knows the precise probabilities.

3.5.2 Dealing with subjective probabilities

The problem of absence of precise probabilities was dealt with above. Unfortunately, there is another problem associated with applying probability measures in rational antitrust analysis. This is the problem of subjective probabilities. Although Savage (1954) elegantly proved that the principle of maximizing expected utility (and equivalently, minimizing expected loss) also applies for rational decisions based on subjective probabilities as long as those probabilities satisfy the rationality criteria, this does not help us if we are in search for objective rational decisions. If the probabilities applied in antitrust analysis are intrinsically subjective, without corresponding objective values, then the rationality of antitrust decisions would be subjective too. What would appear a rational decision for one person would appear irrational for another person. There would not be any objective rational antitrust decisions.

The question is, then, whether there are any objective probability measures. Is there, given the evidence available, any objective true value for the probability of violation? At least in many cases, there will be some objective truth. The parties in a violation will often, but far from always, know if they violated the law or not. Parties in a price conspiracy might, for example, know very well if they agreed upon prices or not, and thus know if they violated the law. Parties in some complex vertical agreements, on the contrary, may not know if they violate the law or not. However, we are not interested in determining the objective truth with certainty in this context. We are interested in whether there is some objective way to assess the probability of violation given the presence of some evidence. The objectivity of knowledge is a complex, more general, epistemological question that is studied in the philosophy of decision theory and the philosophy of science in general.¹⁵⁷ General philosophical epistemological issues are outside the scope of this study, though some arguments for assuming the existence of objective probabilities for antitrust violations are presented.

¹⁵⁷ See, for instance, Achinstein (2005) p. 95 f. Gilboa (2009) p. 138 f. See also Posner (2008) for a practical discussion on epistemological issues in legal analysis.

By using Bayes' rule described above, the probability of some hypothesis given some evidence, e , can be written as

$$p(H|e) = \frac{p(e|H)p(H)}{p(e|H)p(H) + p(e|\text{not } H)p(\text{not } H)}.$$

This means that the probability of a hypothesis given some evidence consists of two main components: the a priori probability that the hypothesis is true $p(H)$,¹⁵⁸ and the probability of the evidence given that the hypothesis is true or not true, $p(e|H)$ or $p(e|\text{not } H)$. The a priori probability is a person's probability assessment of H before any evidence is collected, for instance, that some conduct has anticompetitive effects in violation of the antitrust law. The probability of evidence given that the hypothesis is true or not, is the probability that the evidence will be present given that the hypothesis is true or not, for instance, the probability of certain market characteristics given that some conduct has or has not had anticompetitive effects.

It might not be unreasonable to assume that the a priori probabilities are of a more subjective nature than the probability assessment of the evidence given the truthfulness of a hypothesis. Dependent on what school of economics you belong to, the a priori attitude towards the anticompetitive effects of certain vertical restraints might, for instance, differ substantially.¹⁵⁹ It might also be subjective differences when it comes to the probability of some evidence given the truthfulness of a hypothesis, however, there appears to be a higher level of consensus on this issue. If we assume that two persons disagree on the a priori probability that some vertical restraint restricts competition, they might still agree upon whether evidence is more consistent with the hypothesis that the vertical restraint restricts competition than the hypothesis that the vertical restraint does not restrict competition. Maybe some evidence is disputable, but, as more and more evidence is gathered, there will be more and more consensus. Besides, and maybe more importantly, there are established scientific methods to assess evidence's consistency with a hypotheses. Rational inferences from evidence based on probability calculus are elaborated upon further in Chapter Five. Statistical models can be used to test hypotheses based on real world data. When this is used in the context of economic models this is referred to as econometrics. The use of statistical and econometrical methods to improve antitrust analysis will be a topic in Chapter Six.

¹⁵⁸ The probability that H is not true, $p(\text{not } H)$, also figures in the model, but by the laws of probability $p(\text{not } H)$ equals $1 - p(H)$.

¹⁵⁹ This will elaborate on in Chapter Six.

Therefore, the main problem related to subjective probabilities is the subjectivity of the a priori probabilities. However, it can be argued that the subjectivity of a priori assessments is a limited problem for obtaining objective probabilities. Firstly, as more and more evidence is gathered, the impact of the a priori assessment of the probabilities will be less and less.¹⁶⁰ Correspondingly, the impact of evidence becomes larger and larger. Secondly, although the a priori probabilities might be subjective, there may be more or less objective consensus to fix the a priori probability as a matter of law. The presumption of innocence used in criminal law illustrates this. This can be illustrated by an example outside antitrust law. Although our a priori assessment of the probability of the guiltiness of some serial robber might differ from person to person, we might still agree upon the use of the presumption of innocence when his case is tried in the court of law. As described in more detail in the subsequent chapters of this study, antitrust is filled with presumptions rules that, to some extent, fix the priors in the application of the law.

Thus, to conclude this subchapter, subjective probabilities might constitute a barrier in the pursuit of an objective rational antitrust analysis. However, this problem is mitigated by evidence gathering and by pursuing objective methods for assessing evidence. This means, more precisely, to rationally adhering to the rules of probability calculus and, more generally, adhering to objective scientific methods in assessing evidence. The question of rational evidence assessment in will be returned to in Chapter Five, and the use of objective scientific methods in the assessment of economic models will be returned to in Chapter Six.

3.6 What is the utility and loss from an antitrust decision?

The rational decision maker maximizes expected utility or, equivalently, minimizes expected loss. Thus, the rational decision depends on the decision maker's measure of utility (which is also used to derive the loss of errors). This means that the rational decision depends on the decision maker's preferences. If a rational antitrust decision is dependent on the personal preferences of the decision maker, then what is the point of pursuing rational antitrust decisions? The same decision might be irrational for someone else. An important question is, thus, whether there are some objective measures of the utility of an antitrust decision that can be made as an objective standard for assessing the rationality of antitrust analysis and the resulting decisions.

¹⁶⁰ See Wasserman (2003) p. 181 f. One cannot say in general that the impact of priors will be eliminated as more evidence is gathered. The impact of priors becomes less, though.

3.6.1 Economic welfare and efficiency as an objective standard

A natural candidate for guidance on some objective measure for the utility of antitrust decisions must be the purpose of the antitrust laws. The purpose of antitrust is a debated topic, as discussed in Chapter Two. However, most antitrust scholars would probably agree that promoting the competitive process to promote efficiency and economic welfare has some merits as the purpose of antitrust. Fortunately, efficiency and welfare are exactly the measures that economists use in the rational assessments of policies. Economic theory provides a framework to assess the effectiveness of policies and to assess the welfare properties of policies. Thus, the welfare measures established in microeconomics comprise a candidate for an objective measure of the utility and losses from antitrust decisions.

Efficiency can, in general terms, be described as to not waste scarce resources. One concept of efficiency is Pareto-efficiency¹⁶¹ which means that no Pareto-improvements are possible. A Pareto-improvement is some action that makes at least one person better off without making anybody else worse off. This means that those that benefit from an action will benefit so much that they are able to compensate those who lose, keeping their utility as least as high as it was, and that this compensation is actually performed if required. Another concept of efficiency is Kaldor-Hicks efficiency. Kaldor-Hicks efficiency means that potential Pareto-improvements are realized without necessarily compensating those who lose from the action. Economic welfare is normally considered improved if a potential Pareto-improvement is realized. This means that it is normally not a requirement for an action to be considered welfare improving that those that lose from the action are fully compensated as long as those who benefit do so more than those who lose.¹⁶² However, for some policy considerations, there are elements of compensation requirements. In EU antitrust law it is, for instance, normally assumed that consumers must be better off for the ability of some effective anti-competitive practice to escape illegality.¹⁶³

Utility must be translated into monetary terms for welfare to be measured in money. People who lose utility from some action are assumed able to be compensated in monetary terms to stay at same utility level. The compensation required is a measure of the monetary

¹⁶¹ Named after Vilfredo Pareto (1848-1923).

¹⁶² When it comes to policy questions, this can be defended by the existence of other policies that distribute the surplus. If some policy makes the “cake” bigger despite some being worse off, other policies such as tax policies and subsidy policies can be used to redistribute the cake in the politically desirable way.

¹⁶³ As was discussed in the Chapter Two, the compensation as such might not be the main purpose of such requirements.

value of the utility loss. The same applies reverse with actions that increase utility.¹⁶⁴ Welfare in a market context can be briefly described as the utility of consumption measured in money less the real resources spent on production, reflected by costs. Any action that increases this difference is welfare improving by realizing a potential Pareto-improvement. Thus, efficiency improvements increase welfare. A measure of welfare in the context of a market is the total economic surplus. The total economic surplus is the willingness to pay, reflected by demand, less total costs. This is an approximation to the exact measure of welfare determined by the potential compensation principle above.¹⁶⁵ A measure of consumer welfare is the consumer surplus, which is the willingness to pay, reflected by the demand-curve, less the price paid by the consumer. The economic welfare concepts will be discussed in more detail in Chapter Six.

Remember from above that the optimal antitrust decision minimizes the expected loss of an erroneous decision. Finding violation of law minimizes expected loss if $(1-p_V)L_V < p_V L_{NV}$.

$L_V = U_{NV}(a_{NV}) - U_{NV}(a_V)$ is the loss due to wrongfully making the decision that the law was violated, a_V . This is the forgone utility of making the right decision of not violation less the utility of making the wrong decision as such. The forgone utility from not making the right decision of not violation is that some lawful presumably welfare-improving conduct is discouraged, both in the individual case and in the future through legal precedence. Note that some might say that even prohibiting lawful behavior might generate some utility by spreading knowledge of the existence of the law, and in this way contribute to deterrence. This is not necessarily a valid inference, though. Prevention of lawful behavior might contribute to legal arbitrariness and can reduce prevention of unlawful behaviour. If finding violation is arbitrary whether an action is rightfully a violation or not, one might as well violate the law.¹⁶⁶

$L_{NV} = U_V(a_V) - U_V(a_{NV})$ is the loss of wrongfully deciding not violation, a_{NV} . This is the forgone utility of making the right decision of violation less the utility of making the wrong decision as such. The forgone utility from not making the right decision of violation is that some presumptive welfare-reducing practice is not discouraged in either the individual case or in the future through legal precedence. It is difficult to assess whether there are any benefit

¹⁶⁴ To get a money measure of the gain, one could ask how much money must be taken from them for utility to stay at the same level.

¹⁶⁵ Economists operates with equivalent variation (EV) and compensating variation (CV) as exact monetary measures of welfare, while the total surplus (TS), consisting of consumers surplus (CS) and producers surplus (PS) are approximations. See Varian (1992) p. 160 f.

¹⁶⁶ See Kaplow and Shavell (1994b) and Posner (2011) p. 827. See Also Spier (2007).

from the wrongful decision of not violation when the law was actually violated. Some enforcement costs are at least saved.

Thus, so far, promotion of efficiency and then economic welfare seems so be a good candidate for an objective utility measure that can be used to achieve an objective antitrust analysis. Some problems will soon follow, though.

3.6.2 Problems with economic welfare and efficiency as an objective standard

The economic welfare standard seems to provide a good objective standard for the utility (and loss) of antitrust decisions. However, there are some problems hiding in the details. As discussed in Chapter Two, there might be additional purposes of antitrust laws. Such a purpose might be to promote cross border trade, as was argued in EU competition law. In the US, some industrial policy goals might be argued to be additional objectives of antitrust policy. If such additional objectives cannot be incorporated into the objective economic welfare calculations, this might be an obstacle to the possibility of an objective rational antitrust analysis.

Even if antitrust analysis were not disturbed by such additional purposes, there is some confusion as to whether the correct economic welfare standard should be total welfare or consumer welfare. If total welfare were pursued, the antitrust analysis would be rational. If consumer welfare is pursued, in the sense that consumers must receive a fair share of the benefit, there is a risk of irrationality. Assume that there are three possible decisions: one with large total surplus and a small consumer surplus, one with medium sized total surplus and consumer surplus and one with small total surplus but large consumer surplus. Unless there is some objective and rational standard to choose among these criteria, there is a threat both to objectivity and rationality. This issue cannot be resolved here; nevertheless, this is an additional argument for total welfare to be the ultimate standard of antitrust analysis. However, if applying a consumer welfare standard in the single cases improves total welfare, then it can be defended on objective rational grounds.

One additional problem should also be mentioned. The measures of economic welfare are based on economic models. Thus, the economic welfare measures should be considered as model-based inferences. Inferences from economic models are not necessarily correct. Thus, model imperfections and uncertainties should, in principle, be taken into account. The rational use of models taking model uncertainty into account will be discussed further in Chapter Six.

The possible shortages of or failures in of obtaining an objective measure of the utility (and loss) of an antitrust decision might chill some of the interest in studying rational antitrust

decisions. If there is no good way to create an objective measure of the utility of an antitrust decision, making the rationality of antitrust decisions a subjective enterprise, then why bother to study the rationality of antitrust decisions? By the same argument, one could also address the point of having antitrust rules in the first place, or any economic regulation. The economic concepts of efficiency and welfare as objective measures of the utility of antitrust decisions are in this study considered to be good enough to proceed further with the inquiry of rational antitrust analysis with sufficient confidence that such an inquiry can be performed objectively. Thus, economic welfare will be used as a yardstick in the further analysis as a standard for utility in the assessment of rational antitrust analysis.

The question becomes, then, whether the assessment principles and procedures employed in actual antitrust analysis will facilitate objective rational antitrust analyses based on economic welfare as the assessment standard. This is a central question in this study.

3.6.3 Are there alternatives to economic welfare and efficiency as a standard?

Although economic welfare is established as at least an important partial standard for antitrust analysis as discussed above, and in more detail in Chapter Two, it is, for the sake of the argument, interesting to ask whether there could be other standards that would perform better in achieving rational antitrust decisions. Another approach, in line with democracy and in line with fear for a technocratic tyranny from efficiency-seeking economists, is to consider the objective utility of antitrust decisions as some consensus on the utility obtained by the individuals in the society. The utility could, for instance, be based on what would be the result of majority voting or the utility of some elected official.

Social choice is the study of collective decision-making. Kenneth Arrow was awarded the Nobel Prize in economics based on, *inter alia*, Arrow (1951), where he derived the impossibility theorem of social choice.¹⁶⁷ Simplified, Arrow (1951) showed that it is impossible to derive a social utility function based on voting, including majority voting, that generally satisfies the assumptions of rationality. A utility function based on majority voting might, for instance, violate the transitivity axiom. Thus, to base antitrust decisions on, for instance, majority voting in the parliament seems to be a poor instrument in obtaining rational antitrust decisions.

Another approach promoted by another winner of the Nobel Prize in economics, John C. Harsanyi, is to construct a social utility function as a weighted sum of individuals' utility.

¹⁶⁷ Developed further by another winner of the Nobel Prize in economics, Amartya Sen. See Sen (1970, 1995 and 1999).

This utility function will, itself, satisfy rationality.¹⁶⁸ One could imagine that this weighted sum of individuals' utilities is represented by the utility function of an elected official or that the elected official is supposed to make decision in accordance with such a weighted sum. When it comes to elected officials, however, their personal preferences might be rational, but public choice theories tell us that their utility might be a poor approximation to the maximization of some fair weight of peoples' individual preferences. Interest group influence and politics might have the result that the utility of the members of some particular interest group gets far more weight than a fair weight, and might, in addition, be in conflict with efficiency and economic maximization of welfare.¹⁶⁹ Thus, letting some elected representative make antitrust decisions according to his own preferences might give us rational decisions based on his own preferences, but might be a poor instrument to obtain rational decisions if some "fair" weighted sum of individual utilities is the standard we want to be applied.

Thus, basing antitrust decisions on the personal preferences in a system of representative voting or of an elected official might be a poor instrument to yield objective rational antitrust decisions.

3.7 Rational antitrust analysis and actual antitrust analysis

A normative theory for rational antitrust analysis was outlined above. This involved which requirements rationality imposes on antitrust analysis and how this applies to the components of antitrust analysis. It was also discussed whether there could be such a thing as an objective rational antitrust analysis that can be used to achieve objective rational antitrust decisions. It was concluded that there are good enough objective measures on both probabilities and utilities to proceed with the study of an objective rational antitrust analysis.

Given the existence of such an objective rational analysis, the next question is to what extent antitrust analysis as it is actually performed corresponds to this objective rational antitrust analysis. This will be the chief topic in the subsequent chapters of this study, which address whether the assessment principles and procedures applied in antitrust are likely to yield rational antitrust analyses. This subchapter briefly addresses the question of whether rational antitrust analysis and actual antitrust analysis are compatible issues. Is it possible to pursue rationality within the framework in which antitrust analysis is actually executed? This is necessary to answer the research question on whether rationality can guide antitrust analysis, which will be addressed later in this chapter.

¹⁶⁸ Harsanyi (1955, 1979).

¹⁶⁹ See Olson (1965), Stigler (1971), Peltzman (1976), and Becker (1983). George Stigler and Gary Becker are also winners of the Nobel Prize in economics.

3.7.1 The substantive antitrust rules

The antitrust rules constitute the substantive legal framework for antitrust analysis. The antitrust rules were described in Chapter Two above. The antitrust statutes themselves, both in the US and the EU, are quite wide and general, leaving it to case law to develop the more precise content of the antitrust laws. Thus, it is the courts and other authoritative decision makers that develop the substantive content of antitrust law. This is done within the frames of the legal procedure.

The court has to demonstrate valid methods of legal reasoning in determining the content of the antitrust rules. Thus, the principles of jurisprudence and legal reasoning naturally have a strong impact on legal decision making.¹⁷⁰ Imperative methods of legal reasoning, such as the use of precedence and the use of analogy, can potentially threaten the rationality of antitrust analysis. The use of precedence might create a path-dependence diverging from rationality. An analogy not taking into account relevant similarities and differences might result in a decision that fails to coincide with rationality.

However, the relatively wide antitrust statutes combined with pragmatic methods of legal reasoning, where the purpose of the law and the consequences of alternative decisions are guiding the determination of the rules, increases the possibility of achieving rational rules. This is, in particular, the situation in antitrust where economic welfare is a major purpose of the law. This makes antitrust an almost ideal substantial legal framework to facilitate rational rules.¹⁷¹ The relationship between the methods of legal reasoning and the rationality of antitrust rules will be discussed further in Chapter Four.

3.7.2 Antitrust analysis and the antitrust legal procedure

Actual antitrust analysis is performed within the frames of a legal procedure. The characteristics of the legal procedure have a crucial impact on actual antitrust analysis and the resulting decisions. The various properties of the legal procedure are thus essential in assessing the rationality of antitrust analyses.

As described in Chapter Two, the organization of the legal process can broadly be divided into two types: the inquisitorial and the adversarial systems.¹⁷² In the inquisitorial

¹⁷⁰ Posner (2008) normatively and descriptively discuss the established methods and standards for legal argumentation in US and how those methods are likely to impact the legal decisions.

¹⁷¹ See Posner (2008) p. 376 for a similar point of view.

¹⁷² The separation between the inquisitorial system and the adversarial system is not at dichotomy. There are hybrids between the inquisitorial and adversarial systems. In other words, it is a sliding scale between the inquisitorial and adversarial system. See Parisi (2002). This will be discussed further in the subsequent chapters of this study, in particular in Chapter Five.

system, the fact finder and the decision maker is the same decision body. This characterizes the European Commission's enforcement of the EU competition laws. In the adversarial system, two parties compete to convince an independent decision body. This characterizes the situation when a case is brought to the court for a decision. In the US, the antitrust enforcement is mainly adversarial. Both systems have their pitfalls and benefits. This will be explored in detail in the subsequent chapters of this study.

The impact of the procedural system on the fact-finding process and the outcome of the decision is studied in the field of law and economics.¹⁷³ The inquisitorial system might reduce the cost of fact finding, but at the cost of less accurate facts compared to an adversarial system. Thus, the procedural system may have a significant impact on antitrust analyses and the resulting decisions. The impact of the procedural system on antitrust decisions and the rationality of antitrust decisions will be discussed in more detail in the subsequent chapters.

It is, in theory, possible to pursue rational antitrust analysis both in the adversarial and inquisitorial system. Both systems are compatible with rational antitrust analysis in the sense that none of the systems excludes the possibility to pursue rationality. However, both systems contain some imperfections that constitute obstacles for obtaining rationality. Such imperfections are addressed briefly below, and then fully explored in the subsequent chapters of this study.

3.7.3 Some obstacles for rationality in antitrust analysis

Institutional factors

The persons that make antitrust decisions have their own preferences that might deviate from an objective standard. What recognizes antitrust decision makers, whether they are politicians, appointed judges, or bureaucrats, is that they are public officials working in a political system.¹⁷⁴ The theories of public choice shed light on the incentives of public officials whether they are directly elected in a political procedure or derive their authority by being appointed by political figures. The desire for reelection, interest group influence, and other forms of political capture are likely to influence the decisions of politicians.¹⁷⁵ Budgets, salary, and career opportunities are factors that are likely to affect the incentives of employed public officials. Thus, the theories of public choice become relevant in studying the

¹⁷³ See Posner (2011) part VI, Sanchirico (2007) and Spier (2007). This issue will be scrutinized in Chapter Five.

¹⁷⁴ If antitrust issues are decided in an arbitration court, the decision makers are not public officials. However, antitrust issues decided in arbitration courts are not considered official antitrust decisions in this study.

¹⁷⁵ See Olson (1965), Stigler (1971), Peltzman (1976), and Becker (1983). George Stigler and Gary Becker are also winners of the Nobel Prize in economics.

performance of antitrust analysis and the resulting antitrust decisions. The application of theories of public choice to study incentives in antitrust analysis will be a returning issue in the further scrutiny of actual antitrust analysis in this study. Although institutional factors do not exclude rational antitrust analysis, they constitute a risk of biased decision making.

Practical methods of reasoning and cognitive biases

As discussed above, precise probability measures are not available in antitrust analysis. In practical reasoning, more practical methods must be utilized in the decision making, such as the use of analogies and more intuitive heuristic methods. These methods will be discussed in detail in the subsequent chapters of this study.

Rational decision theory can be seen as normative opposed to descriptive decision theory. Descriptive decision theory is about how decisions are actually made. The branch of economics called behavioral economics intersects with psychology, and studies actual decision making, especially how cognitive biases might affect decisions to deviate from rational decisions. Thus, lessons from behavioral economics might be important to understand how antitrust decisions are actually made.

An early example of deviation between actual and rational decisions was provided by the French economist and winner of the Nobel Prize in economics, Maurice Allais¹⁷⁶ as a critique of Savage. Allais showed that, in the choice between a sure award of one million dollars and a lottery with a one percent chance of winning zero, a 10 percent chance of winning five million, and an 89 percent chance of winning one million, many would prefer the former. On the other hand, the same persons would prefer a lottery winning five million with 10 percent probability and zero otherwise over a lottery winning one million with an 11 percent probability and zero otherwise.¹⁷⁷ This behavior is inconsistent with the maximization of expected utility. If the first choice maximizes expected utility, the latter cannot and vice versa. The underlying axiom violated here is the axiom of independence of irrelevant alternatives. The two choices are equal, except that in the first lottery there is an 89 percent chance of winning 1 million while in the last there is an 89 percent chance of winning zero independent of the choice made. Thus, in the first lottery there is more reason to regret if the zero award materializes than in the second, where it, after all, is quite a big chance that the zero award materializes anyway. According to the axiom of independence, this is not rational to take into account.

¹⁷⁶ Allais (1953).

¹⁷⁷ Even Savage made these choices when presented by Allais.

Ellsberg (1961) presented another “paradox”. Assume that an urn contains 90 balls: 30 red balls and 60 balls that are mixed between black and yellow balls in unknown proportions. Ellsberg showed that many would prefer a lottery giving 100 dollars if a red ball is drawn from the urn over a lottery giving 100 dollars if a black ball is drawn from the urn. On the other hand, the same people would prefer a lottery giving 100 dollar if a drawn ball is yellow or black over a lottery giving 100 dollars if a red or yellow ball is drawn. This behavior is inconsistent with the maximization of expected utility. However, what can be interpreted from such behavior is that people prefer to choose under known probabilities than unknown probabilities. The first lottery gives a “sure” probability of 1/3 of winning, and the second a “sure” probability of 2/3 of winning. This can be interpreted as a preference for known probabilities, which is not taken into account in the axioms for rational decisions described above.

These “paradoxes” are interesting, but might not provide so much systematic information of cognitive biases. D. Kahneman and A. Tversky¹⁷⁸ have provided important knowledge of cognitive biases in decision making through extensive seminal research on the topic, e.g. Kahneman and Tversky (1973) and Kahneman et al. (1982). Examples of cognitive biases are the base rate fallacy on how people fail to take into account prior probabilities in their probability assessment, and the loss aversion theory on how people irrationally prefer avoiding losses to making gains. Behavioral economics has now become a popular field for research in economics and has probably boosted the interest in experimental economics. McKenzie (2010) contains an updated and critical survey on some of the research. Some irrationality in decision making can be explained by evolution and rationality. Since the brain has limited processing resources, it can sometimes be rational to be “bounded” rational and make decisions that might appear irrational when weighing saved brain resources against the quality of the decision.¹⁷⁹ This is not a new idea, being pointed out by the Nobel laureate in economics, Herbert Simon in the 1950s.¹⁸⁰ One can say actual decision making rationally utilizes heuristics as a result of evolutionary efficiency. As mentioned above, there are developed generalized expected utility model frameworks that take into account cognitive biases, such as prospect theory,¹⁸¹ Choquet expected utility theory,¹⁸² and maxmin expected utility theory.¹⁸³

¹⁷⁸ D. Kahneman was awarded the Nobel Prize in Economics in 2002 for his works with A. Tversky. Had Tversky been alive at the time they would probably have received the price together.

¹⁷⁹ See McKenzie (2010), Chapters 7 and 8.

¹⁸⁰ See Simon (1955) and Simon (1957). Simon was awarded the Nobel Prize in economics in 1978.

¹⁸¹ See Gilboa (2009) p. 154 f. developed by Tversky and Kahneman (1992).

Cognitive biases have particular relevance for how legal evidence is assessed, including antitrust evidence. Experiments have been done on mock juries that revealed large deviations from rational decision-making. Farnsworth (2007) provides comments and further references to this literature. Decision makers may be subject to confirmation biases which bias the decisions towards prior beliefs.¹⁸⁴ The impact of cognitive biases on decision making will be particularly relevant in the discussion in Chapter Five and Chapter Six.

That actual decision making utilizes informal methods deviating from the methods of rational decision making and may be subject to cognitive biases is a challenge for obtaining rationality in antitrust decision making. This, however, does not make actual decision making incompatible with rational decision making. The challenge is to design assessment principles and procedures that mitigate the impact of such imperfections. This will be discussed further in Chapter Five and Chapter Six.

The impact of argumentation and rhetoric

Legal argumentation and rhetoric has been studied by both philosophers and lawyers since ancient Greece.¹⁸⁵ Argumentation, argumentation techniques, rhetoric, and even abusive of rhetoric by the parties involved in the decision making has a central role in the legal decision procedure. A study of actual legal decision making would be incomplete if the role of argumentation and rhetoric in the process is not taken into account. A challenge for the procedural design is to prevent decision makers from being influenced by non-meritorious abuse of rhetoric. The impact of argumentation and rhetoric on the rationality of antitrust analysis will be revisited in the subsequent chapters of this study, in particular, in Chapter Five and Six.

Multiple decision makers

It is often not one single adjudicator that performs the antitrust analysis, but many adjudicators who must make the decision in concert. In antitrust cases, the decision makers will typically be judges in a collegial body or commissioners in a collegial body. In an adversarial system, as in the US, it is, as a main rule, a layman jury who must reach a collective decision upon the facts.

¹⁸² See Gilboa (2009) p. 145 f. based on Schmeidler (1989).

¹⁸³ See Gilboa (2009) p. 160 f. based on Schmeidler (1989).

¹⁸⁴ See for instance Posner (2011) p. 824.

¹⁸⁵ See for instance Walton (2002).

Collective decision making is analyzed in the theory of social choice, as was described above.¹⁸⁶ Arrow (1951) derived the impossibility theorem of social choice, which showed that it is impossible to construct a utility function based on, *inter alia*, majority voting, which generally satisfies the assumptions of rationality. This has been applied in a legal contexts by, *inter alia*, Easterbrook (1982, 1984b) Thus, the collective nature of antitrust decision making may impose a threat to the possibility of achieving rational antitrust decisions. One way out of this situation is if all decision makers share the same preferences. This will be achieved if all the decision makers are rational and apply unified methods based on objective principles. The complications that follow from the collective nature of many antitrust decisions will be returned to in several contexts in this study.

3.7.4 Are rational antitrust analysis and actual antitrust analysis compatible?

A central topic in this study is whether the assessment principles and procedures in actual antitrust analysis are likely to facilitate a rational analysis. Thus, it would be very premature to make such a conclusion here. However, a question that is not premature is whether rational antitrust analysis and actual antitrust analysis are compatible at all. Is it possible to pursue rationality in actual antitrust analysis? If not, it would be difficult to proceed with a study that is about the intersection between rational antitrust analysis and actual antitrust analysis. Based on the discussion above, it does not seem to be something intrinsic about actual antitrust analysis that categorically excludes the possibility of pursuing rationality.

The substantive antitrust laws do not seem to constitute a major barrier to rational antitrust rules. The general wide nature of the statutes makes it possible to determine the precise content of the rules in accordance with rationality. This depends on the possibilities and restraints associated with the methods of legal reasoning. If the methods of legal reasoning allow for pragmatic reasoning, this makes it possible to let the purpose of the rules and the consequences guide the determination of the rules in line with rationality.

The fact that antitrust analyses are performed within a legal procedure does not prohibit the analysis from being rational. The legal framework that the actual antitrust is performed within does not have a nature that excludes the possibility of reaching rational decisions. There are, however, some obstacles for rational antitrust analyses to be generated by the legal procedure. This creates a potential for improvements that facilitate antitrust analyses that are more rational. The challenge is to arrange assessment principles and procedures in such a way that the resulting decision becomes as rational as possible. The ability of the assessment

¹⁸⁶ See Binmore (2008) for a short introduction.

principles and procedures applied in antitrust analyses to facilitate rational analyses and possible improvements to facilitating rational analyses are the chief issues of this study that are discussed in detail in the subsequent chapters of this study.

3.8 Can and should rationality guide antitrust analysis?

Above it was established what a rational antitrust analysis is, and this was related to the way antitrust analyses are actually executed. The research question as to whether the principles of rationality can and should guide antitrust analysis can now be addressed.

3.8.1 Can rationality guide antitrust analysis?

The question on whether rationality can guide antitrust analysis is dependent on several sub questions. The first question is whether it is possible to derive what a rational antitrust analysis is and apply this in practice. The rationality assessment is based on the presence of precise probabilities that are not likely to be available. Alternative theories of rational decisions, which are less dependent on such precise measures of probabilities, were briefly discussed above, but were not found adequate to be applied in antitrust analysis at the moment. However, it was found that the theory based on presence of precise probabilities is applicable as a normative theory of rational decisions, even the lack of knowledge of such precise probabilities. The challenge is to design assessment principles and procedures that facilitate a decision based on the correct probabilities even if no one knows these probabilities exactly.

Another issue addressed above was that of the subjectivity of probability measures, which could be an obstacle to objective rational decisions. However, it was concluded that the subjectivity of the probability measures most of all influence the a priori probability assessments, while objective methods of assessing evidence are likely to make the subjective probability measures converge towards objective measures as more and more evidence is gathered.

Rational decisions also rely on assessing the utilities associated with various decision alternatives. This is the same as assessing the loss of a wrongful decision. The question is whether there are any objective utility measures that can be used to derive objective rational antitrust decisions. The concept of economic welfare as a utility standard for antitrust decisions gives us an objective standard to assess the objectivity of antitrust analysis.¹⁸⁷

¹⁸⁷ However, as mentioned above, the principles of economic welfare are based on the neoclassical paradigm of economic models. Thus, the uncertainty associated with this particular modeling framework should ideally be taken into account. Rationally in the assessment of economic models will be returned to in Chapter Six.

The wide and general character of the antitrust statutes combined with economic welfare as one of the main purposes of the law provides a good substantive legal framework for rational antitrust analyses. However, it was found that there might be characteristics associated with how antitrust analyses are actually performed that might be obstacles for the actual antitrust analyses being rational. The method of legal reasoning might raise some barriers to rationality in the determination of antitrust rules. Furthermore, antitrust analyses might be influenced by properties of the legal process that the antitrust analysis is performed within, which might bias the decisions away from rationality. However, nothing with the legal framework excludes antitrust analyses and the resulting decisions from being rational. The legal framework can eventually be improved to facilitate rational antitrust analyses.

Thus, despite challenges, it seems reasonable that rationality can guide antitrust analysis. At least, it is worth the efforts to study how assessment principles and procedures used in antitrust analyses today coincide with rationality and whether it is possible to make the analyses more rational.

3.8.2 Should rationality guide antitrust analysis?

If rationality can guide antitrust analysis, the next natural question is whether rationality *should* guide antitrust analysis. There are several arguments for rationality to guide antitrust analysis. Arguably, the chief argument is that a rational antitrust analysis maximizes the expected economic welfare of the decisions, which, in the long run, maximizes the economic welfare of having antitrust rules. Thus, rational antitrust analysis is what gives us the greatest economic welfare in the long run.

By returning to the axioms behind rationality, we can see that rational antitrust analysis provides us with an additional property that might appeal to some. Rationality in the determination of rules will provide coherence and consistency in the choice between rules. Assume that we have three ways to interpret a rule: Alternatives A, B, and C. Rationality will secure that we can rank all these alternatives against each other and that the choice between the rules satisfies transitivity. Assume that we prefer A to B and B to C. Transitivity means that we will prefer A to C. This was a simple example, but by applying the principle of rationality we will secure such coherence and consistency in a more complex environment of many rules. This is not without value. The consistency between many types of abuse interpreted to be abuse of dominance can, for instance, be questioned.¹⁸⁸ If some conduct that

¹⁸⁸ See OECD (2009) p. 21 f.

escape illegality has worse consequences than some conduct that is prohibited, this should, everything else equal, be considered to be wrong. Rationality will prevent such inconsistency.

A last argument for rationality is predictability. Normally, rational decisions are easier to predict than irrational decisions, at least if the irrationality is not systematic. Thus, rationality in antitrust analysis also promotes legal certainty with all associated benefits.

Therefore, the conclusion must be that rationality should guide antitrust analysis.

3.9 Conclusions

In the introduction to this chapter, two research questions were raised: *What is a rational antitrust analysis? Can and should the principles of rationality guide antitrust analysis?* These questions will be addressed in turn.

What is a rational antitrust analysis?

This chapter began by establishing what antitrust analysis is: it is the determination of rules and assessment of evidence in antitrust cases. Then, what a rational antitrust analysis is was established. This is the antitrust analysis that satisfies the axioms of rationality established in modern decision theory. Such analysis will lead the analyses to rational antitrust decisions. Following the axioms is equivalent to maximizing expected utility of antitrust decisions, which again is equivalent to minimizing expected loss.

The axioms of rationality impose quite strong assumptions regarding the presence of precise probability measures. It was explored whether alternative theories of rational decisions that do not impose such assumptions provide better normative guidance on rational decisions, but the conclusion was that they do not do so at the moment. There is potential, however, for alternative decision theories to be applied when they become more operational for legal analysis. Despite the lack of the precise knowledge of precise probabilities, a decision theory based on such knowledge may serve as normative guidance. The assessment principles and procedures can ideally be designed such that the resulting decisions are made as if precise knowledge of probabilities were available.

Furthermore, it was addressed whether there is some objective standard of rational antitrust analysis as both the probability assessment and the utilities involved may be of a subjective character. It was found that, by using objective methods in assessing evidence and using economic welfare as a utility measure, we come close an objective standard for rational antitrust analysis.

Thus, rational antitrust analysis is, more precisely, to maximize the expected economic welfare from antitrust decisions, which is equivalent to minimizing the expected loss of economic welfare from erroneous decisions. Objective methods should be used in assessing evidence.

Can rationality guide antitrust analysis?

It was found in this chapter that rationality can guide antitrust analysis. The lack of precise knowledge of probabilities does not prohibit antitrust analysis from being rational. Assessment principles and procedures can facilitate rational decisions based on such knowledge of exact probabilities, even when no one actually knows these probabilities. Furthermore, it is possible to use objective measures of probabilities and utilities to approach an objective standard for rational antitrust decisions. It was also found that there is nothing intrinsic in the legal framework that excludes antitrust analysis from being rational. The challenge is to establish assessment principles and procedures that facilitate rational analyses. The wide and general antitrust statutes, combined with economic welfare as one of the major purposes of antitrust law, provide a good substantive legal framework for rational analyses.

Should rationality guide antitrust analysis?

The question whether rationality should guide antitrust analysis, was answered affirmative. Rational antitrust analyses will maximize the expected economic welfare from antitrust decisions and, in the long run, maximize the economic welfare from having antitrust laws. Furthermore, rationality secures a system of coherent and consistent antitrust rules. Finally, it can be argued that rational decisions are more predictable, and thus increase legal certainty.

4 Rationality in the determination of antitrust rules

4.1 Introduction and motivation

Antitrust analysis starts with the determination of the rule to be applied in the case under scrutiny. This chapter addresses rationality in the determination of the antitrust rules. In this study, the statutory antitrust laws are taken as given. This means that the focus will be on the determination of rules by those who make antitrust decisions in resolving antitrust cases. In the final stage, it is the courts that determine the antitrust rule to be applied in the case. However, in inquisitorial enforcement systems, like the enforcement of the European Commission, it is the enforcer who makes the first decision and thus determines what rule to apply. As long as this decision is not challenged in the courts, it is the enforcement authority that determines the rule to be applied in the case.

This chapter will first discuss how to implement rationality in the determination of antitrust rules. The study of how to implement rationality in the determination of rules will be delineated to two topics. These are rationality in the choice between rules and standards and the rational precision level of the rules. These topics are particularly relevant in determining rational antitrust rules. This is illustrated by the attention these two topics are given in the antitrust law and economics literature. This will be followed by a discussion on whether it is likely that the current US and EU antitrust rules are characterized by a rational choice between rules and standards and a rational precision level.

Then, the question of whether the assessment principles and procedures associated with antitrust analysis are likely to facilitate the evolution of rational antitrust rules is addressed. This discussion will include possible improvements that can be made to facilitate more rational rules. The main contribution to research will be to provide insight into whether the principles of determining rules in antitrust and the procedural framework surrounding the determination of rules are likely to facilitate the production of rational rules and whether there is room for improvements.

Thus, the chief research questions of this chapter are: *Are the current antitrust rules likely to be rational? Are we likely to observe an evolution towards rational antitrust rules? What can be done to promote more rational antitrust rules?*

4.2 Standards, rules, and precision level in antitrust law

4.2.1 Rationality in the choice between rules and standards

Distinguishing rules and standards

A legal standard means that the conditions for applying a legal rule are determined by a standard. This is opposed to some precise regulation of the situation for when the law applies. With standards, the assessment of the facts in a specific case has more impact on the application of the law. Perhaps the simplest and most illustrative example is road speed limits. A fixed speed limit of, let us say, 60 km/h on a particular road can be characterized as a rule. This is opposed to some general standard saying that a driver should carefully adjust his speed according to the circumstances of the road. In the latter case, the question of whether the driver had driven too fast would be assessed according to the standard on whether he had carefully adjusted his speed according to the circumstances on the road. Another example is some law saying that a person is liable for negligent conduct. Negligence is a standard, as opposed to specific rules on what kind of conduct that triggers liability. One way to abstractly explain the separation between rules and standards, is that, with rules the law is given content *ex ante*, while with standards, the content is given *ex post*.¹⁸⁹

The prohibitions in the US antitrust and EU competition statutes are, *prima facie*, best characterized as standards. The prohibitions against anticompetitive cooperation and abuse of dominance/monopolization impose few limits on what kind of conduct that potentially can be covered by the prohibitions. The same applies to the merger control. This is just a starting point, though. With the evolution of case law and enforcement guidelines, the wide antitrust standards have been given content that at least come close to rules. The evolution of conduct considered *per se* illegal in US is an example of how the initial standard has evolved into rules. By case law, various types of business conduct have evolved to be *per se* antitrust violations, reducing the need to assess the specific effects of the conduct in question.¹⁹⁰ However, as will be discussed further below, the *per se* rules are better characterized as presumption rules, which do not make the specific effects of the conduct totally irrelevant. The use of presumption rules is also the approach used in EU, since conduct considered restricting competition by object is just a presumption of illegality.

The discussion on rules versus standard is not new. Many issues debated today were addressed already in Bentham (1776). The analysis of rules versus standards has been given

¹⁸⁹ See Kaplow (2000).

¹⁹⁰ Krattenmaker (2008), Easterbrook (1984).

substantial attention in legal theory. In recent decades, the analysis of rules versus standards has been studied in law and economics. In law and economics, the relative cost and benefits of standards and rules are used to study the optimal design of rules. A seminal early contribution to the law and economics analysis of rules versus standards is Ehrlich and Posner (1974). Richard Posner's research and reflections on the topic are summarized in Posner (2011).¹⁹¹ Another seminal contribution is Kaplow (1992), summarized in Kaplow (2000). A seminal contribution in the particular field of antitrust is Easterbrook (1984), which, *inter alia*, studies *per se* rules versus rules of reason in antitrust from a law and economics perspective. Kretschmer (2011) surveys the law and economics literature on rules versus standards in general and the literature that addresses rules versus standards in antitrust.

Below, a decision theoretic analysis on the rational choice between rules and standards will be presented. The question becomes which kind of regulation gives the best decisions to the least costs. This can again be formulated as a question of economizing expected losses from errors, and costs of formulating and applying the rules. Rules and standards have different costs and benefits.¹⁹² This study draws on both the general law and economics literature and the specialized antitrust law and economics literature.

The decision theoretic model

The law and economics literature contains various decision theoretic models that, with more or less use of formal mathematics, studies rules versus standards based on various assumptions. A model based on the decision theoretic framework presented Chapter Three, is presented below. This is a general model that captures much of the existing insight from law and economics. After the presentation of this model, certain factors that affect the rationality in the choice between rules and standards with references to the existing insight from law and economics are discussed.

As follows from Chapter Three, the rational decision can be found by making the decision that maximizes expected utility, which is the same as minimizing expected loss.¹⁹³ Assume we are deciding between what kind of rule is best for making rational antitrust decisions: a rule (r) or a standard (s). The costs associated with the formulation and the application of the alternative two legal regulations are C_r and C_s , respectively. Let ELR_r and ELR_s be the expected loss of the rule and the standard, respectively. Thus, this is the

¹⁹¹ Posner (2011) p. 747 f.

¹⁹² See Kaplow (2000) and Posner (2011) p. 747 f.

¹⁹³ This can be derived from the axioms of rational behavior. The intuitive explanation is that this is the decision rule that minimizes losses in the long run.

accumulated type-1 errors (false findings of violations) and type-2 errors (false acquittals) that are associated with the application of the alternative regulations. This could have been modeled mathematically by using a model of how often the errors are likely to occur. However, this will not be necessary for the general level of analysis performed here. Note that deterrence and eventual over-deterrence and under-deterrence are implicitly covered by the model. A consequence of type-1 errors is that not only the conduct in question being discouraged, but also similar conducts in the future due to the eventual precedence and effects. This is over-deterrence. Similarly, type-2 errors may lead to under-deterrence.¹⁹⁴ The rule is preferred to the standard if

$$ELR_r + C_r < ELR_s + C_s.$$

Thus, both expected losses from errors and the cost associated with the legal rules must be taken into account. A rule that generates more expected losses from errors might still be preferred to a standard if the associated costs are sufficiently lower and vice versa. Below, various factors that are likely to affect the tradeoff between rules and standards are identified. Both the general law and economics literature and the specialized antitrust law and economics literature will be relied upon. The error cost approach to antitrust rules has a long tradition in the law and economics literature as well as the specialized antitrust law and economics literature.¹⁹⁵ The factors are discussed using antitrust law issues as examples, but the main discussion the choice between rules and standards in antitrust law will be treated in the separate subchapter on rules, standards, and precision in the actual determination of antitrust rules below.

The cost of formulating and applying the rule

The costs associated with the legal rule are the costs of first formulating the rule and then the costs associated with applying the rule. The cost of formulating a rule is the cost of figuring out the right rule and formulating it. Since the statutes are taken as given and the focus of this chapter is on case-based rules created by the antitrust decision makers, promulgation costs will not be given particular attention. The costs of applying a legal rule include the costs of

¹⁹⁴ See Katsoulacos and Ulph (2009) and Sørsgard (2008) for the explicit modeling of deterrence effect associated with errors in antitrust enforcement.

¹⁹⁵ See, for instance, Erlich and Posner (1974) for a general error cost approach, and Easterbrook (1984) for an error cost approach in antitrust.

enforcing the rule and the cost borne by private parties to learn the rule for deciding compliance.

The costs described above can be analyzed within a standard model of microeconomic analysis where formulating the rule is a fixed cost and applying the rule is a variable cost.¹⁹⁶ A rule might involve higher fixed formulation costs of finding the appropriate rule to regulate the issue compared to the formulation of a standard. It might, for instance, be higher costs associated with finding appropriate rules to regulate vertical agreements in competition law than formulating a standard that, for instance, simply declares anticompetitive agreements illegal. When the legal rule is first formulated, however, the cost of applying a clear rule will normally be lower than that of applying a standard, since a rule reduces the requirement of performing a factual analysis according to the standard. However, this is not always the case. As rules evolve to become more complex and extensive, the cost of finding out what specific rule that applies to a specific situation might be high. For instance, to assess whether some conduct is covered by an antitrust per se prohibition or not, might, in some cases, be more costly than to just answer the question of whether the conduct is likely to restrict competition or not. Complexity is addressed further in the discussion of precession level below.

Since the formulation of a legal rule is a fixed cost and application is a variable cost, the frequency of use becomes a determining factor in the choice between rules and standards.¹⁹⁷ If a legal rule is expected to be applied to similar circumstances often, this speaks for incurring the fixed cost of making a rule. Infrequent use on the contrary, speaks for a standard.

When it is the court that determines the legal rule, they have resolving the specific case in mind. They might not have either the resources or time to make a full assessment of the consequences of the rules. General courts that only occasionally apply the legal rule may also lack the proper incentives to perform a comprehensive study of whether a rule will be more economical than a standard. This might be different when it comes to an inquisitorial enforcement body, such as the European Commission. The European Commission will more than occasionally face the same situation and may have larger incentives to invest fixed cost in determining a rule to reduce costly efforts later.¹⁹⁸ This theory is consistent with evidence: the production of block exemptions and guidelines seems to be more comprehensive in EU than in US. Incentives in the development of legal rules will be discussed further below.

¹⁹⁶ See Fon and Parisi (2007) and Schäfer (2006).

¹⁹⁷ See Kaplow (1992) and Fon and Parisi (2007).

¹⁹⁸ See Posner (2011) p. 858 for a similar argument regarding inquisitorial enforcement authorities in general.

Losses from errors

The losses from errors are not likely to be the same for rules and standards. A central question is whether a standard or rule approach gives the smallest expected losses due to errors. Both type-1 and type-2 errors must be taken into account. If standards are more adaptable to the particular circumstances being under scrutiny, it is natural to think that there are lower expected error losses associated with a standard than a rule. Rules might be either over-inclusive by discouraging conduct they should not discourage, or under-inclusive by allowing conduct they should not allow. Thus, a standard can more precisely address the conduct to be discouraged in the specific circumstances.¹⁹⁹ A standard does not necessarily mean that all circumstances will be taken into account, but a standard is at least flexible concerning which circumstances can and should be taken into account.²⁰⁰ As will be discussed in more detail in Chapter Five, the optimal gathering of evidence, including the optimal use of presumptions, should regulate the extent of case-specific circumstances that should be taken into account in deciding an antitrust case. This has strong parallels to the so-called “quick look” approach and the structured rule of reason approach, which will be discussed in more detail below.

However, it might not be a very robust inference that standards reduce expected error costs. Standards might be more prone to rent-seeking activities that might bias the results. Rents-seeking will be discussed below. As pointed out by Schäfer (2006), the discretion of the decision maker in the presence of a standard might make standards more vulnerable for corruption. Thus, standards may not work so well in developing countries with corruption problems. Note, also, that there might be substantial biases present when the decision maker assesses evidence. This might have more impact under the standard approach than under the rule approach. This will be further elaborated upon in Chapter Five. If such biases are likely to occur, this would reduce the benefits of less expected errors associated with a standard.

There is also a close connection between losses from errors and standard of proof, as explored in Chapter Two and will be explored further in Chapter Five. The flexibility of the standard of proof is a relevant factor to take into account in the choice between rules and standards. To the author’s knowledge, this point is not formally explored in the law and economics literature, but an informal explanation is offered here. The rational minimization of expected loss means that the decision maker can adjust the standard of proof according to the relative consequences of errors. If a wrong decision in one direction is worse than a wrong

¹⁹⁹ See Hylton (2003) for this approach to analyze *per se* versus rule of reason in antitrust p. 129 f.

²⁰⁰ Kaplow (2000).

decision in the other direction, then the confidence in the facts right for the first decision must be higher for the first decision to be rational. This rational adjustment of the standard of proof mitigates the losses when choosing between standard and rule. If a standard is more precise in addressing the correct behavior, making the expected loss lower, then it is more likely that the optimal standard of proof is closer to a balance of probabilities.²⁰¹ If there is a risk that a rule is over-inclusive, this reduces the relative cost of type-2 errors, as there is a chance that deciding not violation is beneficial even where the law was actually violated. This calls for a high standard of proof for finding a violation in the presence of over-inclusive rules. This high standard of proof mitigates the expected losses from over-inclusive rules. The mitigation of losses through the right standard of proof does not apply if the standard of proof that has to be applied is not adaptable to the specific circumstances of the case. If a high standard of proof is justified by the risk of over-inclusiveness associated with rules is also applied to a standard where there is less risk over-inclusiveness, this mitigates the benefits associated with the greater flexibility in the standard. Thus, if an exogenously determined standard of proof is determined by the risk of errors associated with rules, and this standard of proof is used in the application of the standard, the benefits from introducing a standard is reduced. Conversely, if the legally determined standard of proof has its background in a flexible standard, and the standard of proof is not adjusted with the introduction of rules, this might mitigate the benefit of rules. A simpler way to say this is that if the standard of proof is not flexible, this must be taken into account in the choice between rules and standards.

Thus, no robust answer as to whether standards or rules are generally best in reducing the expected error of a decision is apparent. This depends on the other factors discussed in this section. This includes factors such the need for flexibility, the risk of rent-seeking, at what level the decision can best be made, and the benefits from legal certainty. These issues are discussed in turn below.

Flexibility and adaptability

Standards are more flexible than rules.²⁰² Standards can better address the specific facts in question. Standards increase the room for discretion by the enforcement authorities and, ultimately, the courts. This may make it easier to make decisions and promote conduct that complies with the purpose of the law, despite changes in circumstances. The conduct can be

²⁰¹ However, if a standard is used, errors might be more likely in marginal cases where the expected loss of making error is smaller.

²⁰² Parisi (2004).

assessed in light of the development of the society, scientific development, and other circumstances. Standards are, in other words, adaptable to such developments. In antitrust law, the scientific development, in particular in the science of economics, has had a crucial impact on what interferences in the market are considered suitable to promote competition and economic welfare. If the antitrust law had been rule-based from the start and based on the economic theory available more than 100 years ago, those rules might have been a terrible fit to the understanding of economics today. The more rapidly the development of circumstances is crucial for good regulations, the more advantageous are the standards.²⁰³ Another way to say this is that the more often a rule becomes obsolete and must be revised to fit with the regulatory purpose of the rule, the more advantageous it is to use a standard instead.

Standards are more adaptable to learning by the decision makers. By using a standard, it allows for utilizing the accumulated learning from former cases.²⁰⁴ This is, in particular, relevant for specialized enforcement authorities that accumulate experiences from their own actions and that may improve their knowledge by performing ex-post assessments thereof. Thus, if the learning from case handling is likely to improve the assessments necessary to reach the purposes behind a rule, this speaks for using a standard. The learning aspect also justifies a case-law created development from standards to rules.²⁰⁵ As the decision makers become more confident on the correct regulation on some specific behavior, they may state rules to reduce future application costs. In antitrust law, this is illustrated by the early case-law based establishment of per se violations of the Sherman Act derived from the standard based statutes.

An evolution from standards to rules is natural as more precise knowledge either from scientific development or learning is gained. However, there are examples of the opposite. It might be realized over time that the effects of some conduct are so complex and context-specific that a rule is not suitable. Thus, we might also experience an evolution from rules to standards. This might characterize the evolution towards an effects-based, or more economic, approach in the EU.²⁰⁶ In the US, the Supreme Court abandoned the per se rule approach to

²⁰³ Erlich and Posner (1974) and Fon and Parisi (2007).

²⁰⁴ Schäfer (2006).

²⁰⁵ Kaplow (2000).

²⁰⁶ A specific example is the standard of merger control in the EU. In the previous EU merger regulation, the test of illegality was whether the merger created or strengthened a dominant position, which is known as the dominance test. This was a more rule-oriented test than the significant impediment of effective competition test (SIEC-test) in the present merger regulation. Economic theory and enforcement practice showed that the dominance-test did not satisfactorily address all potentially harmful mergers. With the SIEC-test the EU got a more standard oriented approach more flexible to developments in economic theory and experiences.

minimum resale price maintenance and established a standard-based rule of reason approach for such conduct in *Leegin*.²⁰⁷

Legal certainty

An obvious argument for rules is that they provide more legal certainty in terms of predictability.²⁰⁸ Predictable rules reduce the costs of applying the rule, as mentioned above. It is normally cheaper to assess the legality of some action regulated by a rule than by a standard. However, legal certainty provides more benefits than just the reduced costs of learning the rule. Legal certainty makes it easier to comply with the rule in general. Persons can assess the legal consequences associated with their actions with more confidence. Less predictability of the outcome of an assessment against a standard may cause risk-averse agents to over-comply with rules. In antitrust, over-compliance might result in less aggressive competitive behavior detrimental to competition. In addition, legal certainty in contrast to legal arbitrariness promotes deterrence because the relative gain from complying with the law increases.²⁰⁹ Note that Katsoulacos and Ulph (2010a), who study legal certainty in an antitrust context, have another opinion. They point out that some legal uncertainty may increase the welfare associated with a standard. This will depend on whether the uncertainty performs better in deterring more harmful actions that else would not have been deterred than deterring beneficial actions that else would not have been deterred.²¹⁰

However, it is not necessarily always the case that rules provide more legal certainty than standards. As rules evolve to become more complex and extensive, what specific rule that applies to a specific situation might be associated with substantial uncertainty. Applying some predictable standard might be better and provide more legal certainty.²¹¹ For instance, to assess whether some conduct is covered by an antitrust per se rule or not might be less predictable than to just answer the question if the conduct is likely to restrict competition or not. In particular, this may be the case for business decision makers. For instance, if some business managers plan to exchange some information, it might be easier for them to relate to

²⁰⁷ *Leegin Creative Leather Prods, Inc. v. PSKS, Inc.*, 551 US 877 (2007).

²⁰⁸ Sullivan (1992), Parisi (2004).

²⁰⁹ See Posner (2011) p. 827. If the risk of being convicted is not much different whether you follow the law or not, one might as well break the law. See Schinkel and Tuinstra (2006) for an exploration of this argument in antitrust enforcement using a collusion-model.

²¹⁰ See also the discussion in Posner (2011) p. 826 f.

²¹¹ Fan and Parisi (2007)

the question of whether this exchange is likely to restrict competition than to relate to a large complex body of rules that regulates information exchange.²¹²

Rent-seeking biases

In the literature, the reduced rent-seeking costs in the application of the rules have been indicated as an advantage with rules relative to standards.²¹³ With standards, there is more room for discretion, which again gives more room for rent-seeking in the application of the standard. Rent-seeking involves investment in non-meritorious arguments to persuade the decision maker to make a wrong decision. Rent-seeking not only involves the real costs associated with the rent-seeking activities as such, but also the costs of errors if the rent-seeker succeeds in persuading the decision maker to make a wrong decision. Rent-seeking might, for instance, involve resources in trying to exploit cognitive biases or other irrationalities that may influence the decision maker. In the choice between rules and standards, we have to face the reality that the decision maker will not always make rational decisions. We can, for instance, not base the choice between rules and standards in antitrust on the premise that the decision maker will rationally assess the economic evidence according to its merits. This will be discussed further both in Chapter Five and Six. The parties involved will not necessarily have any interest in the correct assessment of evidence. This lays the ground for rent seeking. Thus, properties of actual decision making must be taken into account in the choice between rules and standards. If it is a large chance that evidence will be assessed incorrectly, the benefits of a standard are reduced.

However, the rent-seeking argument for rules must be modified. Although a rule might reduce the potential for rent seeking in the specific case, a rule approach might shift some of the rent-seeking from the application of the rule to the creation of the rule.²¹⁴ Rent-seeking at the creation stage of the rule might give a non-optimal rule and have much greater consequences than the case by case rent-seeking associated with a standard. This is particular relevant for promulgation, though this is outside the scope for this study. Still, by the principle of precedence this is also relevant for court-made rules. The principle of precedence will be returned to below.

²¹² The costs of complexity in the discussion on precision of rules will be returned to below.

²¹³ See for instance Christiansen and Kerber (2006).

²¹⁴ See Christiansen and Kerber (2006), Kaplow (2000) and Posner (2007) p. 583 f.

Knowledge and decision level

The choice between rules and standard is also a choice between decision levels.²¹⁵ Standards leave more discretion at the level at which the decision is taken. Rules retain more control at the rule-making level. A standard may utilize decentralized knowledge gained by the decision maker. This may apply to situations where decentralized learning is important in understanding the consequences of alternative decisions.²¹⁶ It is not always the case that decentralized knowledge is superior to centralized knowledge. When rules are promulgated after a careful assessment involving hearings of all parties affected by the rules, the rules can reflect more knowledge than the knowledge that can be utilized in standards. The legislator can exploit informational advantages in knowing what kinds of behaviors which are harmful.²¹⁷ As mentioned, promulgation is outside the scope of this study; however, this is still worth noting because if courts and other antitrust decision makers want to create rules, some of the same considerations should be taken into account. Has the decision maker such a superior knowledge to trump the benefit of decentralized knowledge?

4.2.2 Rational precision level of antitrust rules

Precision level of rules

Another issue in the formulation and determination of legal rules is the precision level of the rules. This is also referred to as the level of differentiation in the law, the level of complexity of the law, or the level of detail in the law. The precision level is, in principle, relevant both for standards and rules. A standard can be more precise by, for instance, prohibiting anticompetitive conduct detrimental to welfare instead of just anticompetitive conduct. Rules can be more precise by describing in more detail when a certain conduct is illegal. For instance, “agreements on prices between competitors holding more than 10 percent of the market each are illegal” is more precise than “agreement on prices is illegal between competitors”. Although precision level is relevant for both a standard approach and a rule approach, the precision level of rules will be given most attention here. A more precise rule can, in some sense, reduce the difference between rules and standards as more detailed rules can reflect a more differentiated legal assessment of distinguishable types of factual situations. In addition, more precise rules can combine standards and rules. A rule can, for

²¹⁵ Kaplow (2002).

²¹⁶ Schäfer (2006).

²¹⁷ See Kaplow (1993). For instance, government agencies might have an advantage in knowing what substances which are harmful to environment. The government might also, for instance, have more information on the potential harm of driving fast in an area, making them more suitable to regulate the speed limit as a rule.

instance, say that “agreements on price between competitors together holding less than 10 percent of the market are always legal, agreements on a price between competitors together holding between 10 and 60 percent of the market are illegal if they restrict competition, and agreements on a price between competitors together holding more than 60 percent of the market are always illegal”. This legal rule applies a standard to the middle case where the competitors together hold between 10 and 60 percent of the market.

In antitrust, the statutory laws themselves are not very precise. The more precise rules must be derived from an interpretation of the law, where court precedence, and especially Supreme Court precedence, is an important source. Above, the distinction between standards and rules in antitrust law implemented as a distinction between per se rules and rule of reason rules in the US was discussed. The parallel in the EU it is the distinction between conduct that restricts competition by object and that conduct that restricts competition by effect. In practice, the distinction in both systems is blurred into more precise rules. There are intermediate forms where more precise presumption rules gradually have evolved from precedence. This is often described as structured rule of reason, truncated rule of reason, or a “quick look” approach.²¹⁸ This means that a full-fledged effect analysis of conduct might not be necessary, but still some further investigations of the factual circumstances has to be done than just establishing the conduct as such, such as investigating some structural characteristics of the market in question. Anticompetitive effects are presumed if some facts are present without the need of a full rule of reason inquiry. The stronger the presumption that some conduct is harmful to competition, the less need there is for an analysis of effects. This will be discussed in more detail in the section on standards, rules, and precision level in the actual determination of antitrust law.

The efficient precision level of rules is studied in law and economics. The optimal precision of rules is touched upon in Ehrlich and Posner (1974). A seminal contribution is Kaplow (1995), summarized in Kaplow (2000). The main idea is that more precise rules are more costly to draft and more costly to apply, but provide benefits by precisely addressing the intended conduct. The expected loss from errors is thus lower. Christiansen and Kerber (2006) studies optimal differentiated rules in an antitrust context. The authors criticize the European Commission for not adequately exploring the possibility of optimal differentiated rules in the pursuit of a more effect-based approach in antitrust. Beckner and Salop (1999) uses decision theory to study optimal rules in antitrust. This is developed further in Kerber et

²¹⁸ See Christiansen and Kerber (2006), Hovenkamp (2005) p. 265 f., Gellhorn et al. (2004) p. 200 f. and Hylton (2003) p. 113 f. See also Gavil (2008).

al. (2008) and Kretschmer (2011b), which study optimal sequential investigation rules in antitrust. Kretschmer (2011) surveys both the general law and economics literature and the antitrust law and economics literature on the optimal precision of rules. Gavil (2008) studies a quick-look approach in a burden of proof context.

The decision theoretic model

A rational decision can be made by making the decision that maximizes expected utility, which is the same as minimizing expected loss.²¹⁹ The basic framework is the same as the one used to compare rules and standards. Let ELR be the expected loss of a rule. Thus, this is the accumulated type-1 errors (wrongfully finding violation) and type-2 errors (wrongfully finding not violation) associated with the application of the rule. Note that deterrence and eventual over-deterrence and under-deterrence are implicitly covered by the model. A consequence of type-1 errors is that not only the conduct in question, but also similar conduct due to the precedence effect, is discouraged. This is over-deterrence. Similarly, type-2 errors may lead to under-deterrence.²²⁰ We can separate the expected loss of the rule, ELR, into ELR_{t1} and ELR_{t2} , as the expected loss of errors due to type-1 errors and type-2 errors, respectively.

Assume that C is the cost of first formulating the rule and then applying the rule included enforcing it. We can write the expected total costs of a rule as

$$ELR = ELR_{t1} + ELR_{t2} + C.$$

Now, let d be the precision level of the rule. The precision level affects both the expected losses from applying the rule and the costs of drafting and applying the rule. This means that we can write the sum of expected total costs of a rule as

$$ELR(d) + C(d) = ELR_{t1}(d) + ELR_{t2}(d) + C(d).$$

This model is similar to the analytical framework used in Christiansen and Kerber (2006). The level of precision has an effect on the expected loss of errors, both type-1 and type-2 errors. The costs of formulation and application are also dependent on the precision

²¹⁹ This can be derived from the axioms of rational behavior. An intuitive explanation is that this is the decision rule that minimize losses in the long run.

²²⁰ See Katsoulacos and Ulph (2009) and Sørsgard (2008) for the modeling of deterrence effects and errors in antitrust enforcement.

level, d. The optimal level of precision is where the gain from more precise rules equals the costs of more precise rules. This is where the marginal gain of precision, which are the reduced expected losses from errors, equals the marginal cost of precision.²²¹

Various factors that might influence the optimal precision level of rules are discussed below. Lessons from the law and economics literature as well as the specialized literature on antitrust law and economics are relied upon, using examples from antitrust. However, the discussion of the choice of precision level in the actual determination of antitrust rules will be discussed in a separate section below.

Costs of formulation and application

On the contrary to the choice between rules and standard that was discussed above, it is not necessarily a tradeoff between the costs of formulating the rules and the cost of applying the rules in the choice of how precise rules should be. Rules that are more differentiated are likely to be associated with both higher formulation costs and higher application costs.

The cost of formulating precise rules that always correctly address the conduct to be prohibited might be prohibitive. Note that by “more precise rules” in this context, also “more correct rules” is meant, as very detailed rules drafted at random are likely to be under-inclusive or over-inclusive, thus not improving the decisions. The lack of precision in the Sherman Act can partly be explained by prohibitive costs of formulating more precise rules. The drafters in the 1880s did not know the developments in economic theory that have been so influential as to what antitrust rules that are considered correct today.

The other cost element is the cost of applying the rule for enforcement authorities, private parties, and the courts. Precision increases the legal complexity. More complex rules are generally considered to be more costly to apply both because of learning costs and because more facts have to be gathered and analyzed in the application of the rules. Thus, information costs associated with more precise rules are higher.²²² Note that more precise rules in this context mean more selection criteria.²²³ More detailed rules, in terms of more words, do not necessarily involve higher information cost. In general terms, it is not difficult find situations where a rule with a lower number of words is associated with higher information costs. If the legal rule is a shortly stated standard, the costs of determining

²²¹ See Christiansen and Kerber (2006).

²²² See Kaplow (2000).

²²³ See Kaplow (1995).

whether this standard is satisfied or not may involve higher costs than assessing the facts associated with a rule with a higher number of words.

Error costs

If more differentiated rules are associated with higher formulation and application costs, the benefits must come in the form of lower expected losses from errors. Increasing the differentiation level of rules has an effect on the expected losses from both type-1 errors (falsely finding violation) and type-2 errors (falsely finding not violation). A more precise rule will reduce the expected losses. This is valid either when the less precise rule is over-inclusive or under-inclusive from the start. Assume that the original rule is over-inclusive, for instance, by stating that all horizontal mergers are prohibited. The loss from a type-2 error with such an over-inclusive rule, which is not finding a horizontal merger when there was a horizontal merger, is low because it is likely that many horizontal mergers are beneficial to welfare anyway. A more precise rule stating which horizontal mergers that are prohibited increases the loss from type-2 errors in case of over-inclusive rules. When it comes to losses from type-1 errors, the losses from these errors will be reduced because, with a less over-inclusive rule, those mergers that are wrongfully prohibited are likely to be “border cases” closer to those harmful mergers that are prohibited. With more precise rules, the losses from type-2 errors will increase, while the losses from type-1 errors will be reduced. This makes it optimal to avoid more type-2 errors, which will reduce the expected losses of the rule. The reason is that it will be optimal to avoid more type-2 errors at the same time as the losses from more type-1 errors are reduced. This will result in a more optimal mix of error avoidance. Fewer errors will occur, which will reduce the expected losses of the rule.²²⁴ The same argument can be used if the original rule is under-inclusive. In other words, more precise rules are likely to discourage more harmful behaviors and allow more beneficial behaviors on average.²²⁵ The rule will more often correctly address the conduct intended. Expected losses from errors are reduced.

Note that the standard of proof should rationally be determined endogenously. With very over-inclusive or under-inclusive rules, the decision theoretic correct standard of proof might either be very high or very low. If we, for instance, have a very over-inclusive rule saying that all horizontal mergers are prohibited, a high standard of proof may mitigate many

²²⁴ See Christiansen and Kerber (2006) for a similar argument. See also Katsoulacos and Ulph (2009), which also models deterrence effects explicitly.

²²⁵ See Kaplow (2000).

of the harmful interventions that such a rule facilitates. This high standard of proof may not correspond to the exogenously determined standard of proof that has to be applied according to the law. A more precise rule makes it more likely that balance of probabilities will be closer to the decision theoretic correct standard of proof. Thus, what the correct legal precision level is may also depend also on the standard of proof, or at least the flexibility of the standard of proof.

Rent-seeking

One important question is how differentiation of rules affects rent-seeking costs. The more criteria it is necessary to assess to establish some legal consequences, the more room there is for rent-seeking. Isolated, based on this inference, more precise rules are more prone to rent-seeking. On the other hand, more precise criteria may make it more difficult to disguise the facts as a consequence of rent-seeking. From this perspective, more differentiated rules are less prone to rent-seeking.

It is difficult to give some robust statements regarding rent-seeking and precision level of rules. However, if decision makers are prone to increasing the differentiation level when they actually determine the rules, this opens the gates for rent-seeking behavior from parties who will argue that their particular case should be differentiated out of the rule. A defendant has, for instance, incentives to argue that his specific case should not be subject to a per se rule, arguing for criteria in the per se rule that exclude his case from the per se rule. The per se rules in the US have been narrowed after such arguments.²²⁶ In this sense, the possibility for achieving more differentiated rules by argumentation may facilitate rent-seeking for an increased non-meritorious differentiation level.

Another issue related to rent-seeking and differentiation of rules may emerge if rules are not rational. If rules are irrational and incoherent, the parties will argue that their case should be assessed according to the most lenient rule. It has, for instance, been argued that incoherent rules may have developed under the abuse of dominance-test in the EU. For instance, margin squeeze is argued to be treated more harshly than refusal to deal.²²⁷ This might both give incentives to rent-seeking and ineffective adaption to the rules.

²²⁶ See Elhauge and Geradin (2007) p. 57 f. See also Gavil (2008).

²²⁷ See OECD (2009) p. 21 f.

Legal certainty

Legal certainty is about being able to predict the legal consequences of conduct. If more precise rules mean more transparency surrounding the legal criteria applied, then more precise rules should contribute to more legal certainty. However, a higher precision level is about using more specific criteria to differentiate the legal assessment of different kinds of behavior that are likely to have different consequences. As the body of rules become more complex and more costly to learn, this may, in the end, be detrimental to legal certainty.

Optimal sequential rules

In the antitrust law and economics literature, the study of optimal sequential rules represents a further development of the study of optimal precision of rules. Optimal sequential rules can be regarded as the optimal depth of rules. A seminal contribution is Beckner and Salop (1999), further developed by Kerber et al. (2008) and Kretschmer (2011b), in the form of optimal sequential investigation rules. Optimal sequential rules can be represented by a decision tree, where one optimally gathers evidence according to its probative force and costs. The presence of specific evidence determines whether the case should be decided on the evidence already gathered or if further scrutiny is necessary. It appears that this issue belongs closer to the rationality in the assessment of evidence. Thus, the literature on optimal sequential decisions the application of antitrust law will be discussed in Chapter Five.

4.2.3 Rules, standards, and precision in the actual determination of antitrust law

As follows from the decision theoretic analysis above, there is a substantial amount of law and economics literature that enlighten the rational choice between rules and standards and the choice of precision level in antitrust. The question will be to what extent the recommendations from this literature actually have been implemented by the antitrust decision makers. The analysis of the choice between rules and standards and choosing the precision level of rules is relevant both in the statutory design of rules and the later determination of precedence-based rules. Here, the statutory design is taken as given, so the attention will be given to the determination of rules by the antitrust decision makers.

It would be a far too ambitious a task for this study to try to determine all the antitrust rules derived from the statutory antitrust standards and assess whether these rules are rational or not. However, some insight is offered into the factors that have actually been applied in the choice between rules and standards, and in determining the precision level of antitrust rules, and whether these factors are likely to give rational rules. The choice between rules and

standards and the choice of precision level is discussed together since the two topics overlap and are interrelated. The categorical choice between rules and standards has evolved into more precise rules based on presumptions.

The actual choice between rules and standards in antitrust law will only be discussed in the context of the substantive assessments of law associated with the cooperation and abuse of dominance/monopolization provisions and merger control. The choice between rules and standards and the choice of precision level also applies to other legal issues, such as in the determination of what an “undertaking” is in EU competition law and what a “person” is in US antitrust law. However, such technical details will not be discussed here.

4.2.4 Rules, standards, and precision in US antitrust law

Per se versus rule of reason

The distinction between rules and standards appeared early in the application of US antitrust law, although with some analytical differences from the way of practicing antitrust analysis today. The story in the US starts already with *Addyston Pipe*²²⁸ in 1898, where the Supreme Court distinguished between ancillary restraints and naked restraints. This distinction was based on the common law heritage of US antitrust law. If prices were set by means other than competition, it was a naked restraint and illegal. An ancillary restraint however, which was a restraint on competition ancillary to some agreement with a legitimate objective, was to be assessed according to its reasonableness. This way to look at it was challenged in *Standard Oil*²²⁹ in 1911, which resulted in the requirement of a full rule of reason analysis in all cases. Some years later, in *Trenton Potteries*,²³⁰ the Supreme Court laid the ground for the modern way of distinguishing between “per se” and “rule of reason” violations of antitrust. In *GTE Sylvania*²³¹ the court stated that per se rules apply to practices that are “*manifestly anticompetitive*.” In *National Society of Professional Engineers (NSPE)*²³² the court stated that

[t]here are, thus, two complementary categories of antitrust analysis. In the first category are agreements whose nature and necessary effect are so plainly anticompetitive that no elaborate study of the industry is needed to establish their illegality—they are “illegal per se.” In the second category are agreements whose

²²⁸ *United States v. Addyston Pipe & Steel Co.*, 85 F. 271 (6th Cir. 1898), *aff’d*, 175 U.S. 211 (1898).

²²⁹ *Standard Oil Co. v. United States*, 221 U.S. 1 (1911).

²³⁰ *United States v. Trenton Potteries Co.*, 273 U.S. 392 (1927).

²³¹ *Cont’l T.V., Inc. v. GTE Sylvania Inc.*, 433 U.S. 36 (1977) at 50.

²³² *Nat’l Soc’y of Prof’l Eng’rs v. United States*, 435 U.S. 679 (1978).

*competitive effect can only be evaluated by analyzing the facts peculiar to the business, the history of the restraint, and the reasons why it was imposed.*²³³

The Supreme Court has stated in *Topco* that “[i]t is only after considerable experience with certain business relationships that courts classify them as per se violations of the Sherman Act.”²³⁴

Furthermore, the Supreme Court has in *State Oil*

*[...] expressed reluctance to adopt per se rules with regard to restraints imposed in the context of business relationships where the economic impact of certain practices is not immediately obvious.*²³⁵

In addition, it can be mentioned that the US guidelines on cooperation between competitors²³⁶ (horizontal cooperation) states in Section 3.2 that

Agreements of a type that always or almost always tends to raise price or to reduce output are per se illegal. The Agencies challenge such agreements, once identified, as per se illegal.

The courts have shown through practice that the assessment is dynamic. On various occasions the, courts have changed rules when the current rules, in light of new knowledge, no longer seemed manifestly anticompetitive. In particular, this became evident with the insight provided by the Chicago-school in the 1970s. The Chicago-school used developments in economic theory to criticize the prevailing skepticism against vertical restraints. The impact of the Chicago-school will be discussed further in Chapter Six. One Chicago-school inspired landmark case was the above-mentioned *GTE Sylvania*, which stated that non-price vertical intra-brand restraints should be judged according to the rule of reason. Another landmark decision is *Leegin*,²³⁷ which provided the final chapter in a series of decisions phasing out the per se prohibition of resale price maintenance established in *Dr. Miles*.²³⁸ In *Leegin* it was established that the last remaining element of the per se rule associated with resale price maintenance, the prohibition of minimum resale price maintenance, was also to be assessed

²³³ Nat'l Soc'y of Prof'l Eng'rs v. United States, 435 U.S. 679 (1978) at 692.

²³⁴ United States v. Topco Assocs., 405 U.S. 596 (1972).

²³⁵ State Oil Co. v. Kahn, 522 U.S. 3, 10 (1997) at 10.

²³⁶ Antitrust Guidelines for Collaborations among Competitors issued by the Federal Trade Commission and US Department of Justice (04/2000).

²³⁷ Leegin Creative Leather Prods, Inc. v. PSKS, Inc., 551 US 877 (2007).

²³⁸ Dr. Miles Med. Co. v. John D. Park & Sons Co., 220 U.S. 373 (1911).

according to rule of reason. Thus, this practice was no longer considered “manifestly anticompetitive.”

Even though the US Supreme Court has expressed experiences as a determining factor in establishing per se rules, and eventually abandoning per se rules, theory seems to have had a large influence in practice. Some of the most important changes in the US regarding per se rules followed the Chicago school critique in the 1970s. As mentioned above, The US Supreme Courts abandoned many of the formerly per se treatments of certain vertical restraints in *GTE Sylvania*. On the other hand, some per se violations that one should expect to have been abandoned in light of the Chicago-school critique still remained for a long time. An example is minimum resale price maintenance, which was abandoned in the end, but not before 2007.

In the statements above, the main question as to whether a restriction should be considered a violation per se is whether the restriction is anticompetitive with sufficient confidence by being “manifestly anticompetitive.” The anticompetitive effects must be so certain that the flexibility to assess the cases individually is not necessary. The statements of the US Supreme Court also seem to require actual experiences to establish per se violations. Thus, theoretical assessment should not be enough. It can be questioned, however, as to what extent this requirement has been implemented in practice. Firstly, there might be methodological difficulties in assessing the actual effects of certain practices. These difficulties will be elaborated on in Chapter Six. Experiences will, of course, also include the courts’ own experiences that certain practices have almost always been considered a violation under the rule of reason standard, qualifying them for a per se treatment. The courts have then utilized decentralized learning as described in the decision theoretic analysis above. However, if some practices are considered harmful just because they have always been considered harmful before, this might be a problem of path-dependence. Path-dependence will be further discussed in the subchapter on the evolution of legal rules below.

The confidence in the anticompetitive effects of certain practices is a relevant factor in assessing the expected loss of a legal rule. It says something about the probability that some type of conduct has anticompetitive effects and thus the probability of falsely condemning lawful behavior (type-1 error) or falsely accepting unlawful behavior (type-2 error). With high confidence in the anticompetitive effects, the probability of making errors is low, reducing the need for individual assessments. The consequences of making a wrongful decision are, however, also relevant. Even if there is a high probability that some conduct has

anticompetitive effects, choosing a rule will still, on a few occasions, deter beneficial behavior. Such a rule might be irrational if the consequences of condemning beneficial behavior are high relative to the consequences failing to condemn harmful behavior. Thus, the consequences of making errors should be taken into account in the considerations. This is not explicitly taken into account in the criteria established by the US courts. It could be argued that those kinds of conduct that are assumed to almost always have anticompetitive effects are not likely to have large positive effects anyway in those few occasions in which the effects are not negative, which would make it unnecessary to take the consequences of errors into account. This might not always be the case, especially in abuse of dominance cases. Condemning conduct that is likely to be anticompetitive but may facilitate innovation in a few occasions may have large consequences in terms of expected errors. Thus, if the courts want to make a rational choice between rules and standards, errors should be taken properly into account.

Costs of formulation and application are also relevant in the choice between rules and standards. Are the reduced variable costs associated with a rule worth the fixed cost of formulating the rule? This factor is not explicitly mentioned by the courts. Furthermore, the courts have not explicitly mentioned the costs associated with rent-seeking, which may tip the scale in favor of a rule.

Thus, as a conclusion, it seems like the determining factor for the US courts in the choice between rules and standards is a high probability of anticompetitive effects. Both actual experiences and theory are relevant for assessing the probability. This probability is necessary, but not sufficient, to take into account in determining rational rules.

From per se versus rule of reason to precision and presumptions

The distinction between per se rules and rule of reason rules has become blurred in recent practice.²³⁹ On the one hand, per se rules get more and more precise by incorporating more criteria relevant for a per se rule to apply²⁴⁰. On the other hand, a rule of reason assessment has to stop at some point. Dependent on the type of case, the rule of reason assessment can be better described as a truncated rule of reason, structured rule of reason, or “quick look” approach, which is something in between per se and rule of reason.²⁴¹

²³⁹ Hovenkamp (2005) p. 265 f

²⁴⁰ See Elhauge and Geradin (2007) p. 57 f., Hovenkamp (2005) p. 255 f.

²⁴¹ See Christiansen and Kerber (2006), Hovenkamp (2005) p. 265 f., Gellhorn et al. (2004) p. 200 f. and Hylton (2003) p. 113 f. See also Gavil (2008).

One of the first cases that illustrates the blurred distinction between per se rules and rule of reason is *Broadcast Music*. Here, the Supreme Court stated that

*in characterizing this conduct under the per se rule, our inquiry must focus on whether the effect and, here because it tends to show effect, [...], the purpose of the practice are to threaten the proper operation of our predominantly free-market economy - that is, whether the practice facially appears to be one that would always or almost always tend to restrict competition and decrease output, and in what portion of the market, or instead one designed to "increase economic efficiency and render markets more, rather than less, competitive".*²⁴²

This statement can be interpreted as meaning that it is always possible to argue for the efficiencies of some conduct subject to per se scrutiny. If it is always possible to argue that the conduct in question generates efficiencies, and thus is not subject to a “per se” treatment, this is in reality a rule of reason assessment.²⁴³ The statement means that efficient practices in principle escape the “per se” treatment as long as the efficiencies can be proven. This means that it is always a standard “residual” in every per se rule. But then, per se is not a pure rule anymore but a presumption principle, like in the EU.

In *California Dental* the Supreme Court more explicit states the blurred distinction between per se and rule of reason. Here, the court stated that

*[t]he truth is that our categories of analysis of anticompetitive effect are less fixed than terms like “per se,” “quick look,” and “rule of reason” tend to make them appear. We have recognized, for example, that “there is often no bright line separating per se from Rule of Reason analysis,” since “considerable inquiry into market conditions” may be required before the application of any so-called “per se” condemnation is justified.*²⁴⁴

This statement confirms that an inquiry into market conditions may be required also in per se offences. This decision also includes a specific comment regarding preciseness. Referring to the antitrust scholar P. Areeda, the Court states that Areeda

cautioned against the risk of misleading even in speaking of a ‘spectrum’ of adequate reasonableness analysis for passing upon antitrust claims: “There is always something of a sliding scale in appraising reasonableness, but the sliding scale formula deceptively suggests greater precision than we can hope for... . Nevertheless, the quality of proof required should vary with the circumstances”.²⁴⁵

²⁴² *Broadcast Music, Inc. v. CBS*, 441 U.S. 1 (1979) at 19-20.

²⁴³ See Elhauge and Geradin (2007) p. 57.

²⁴⁴ *California Dental Association v. FTC*, 526 U.S. 756 (1999) at 779.

²⁴⁵ *California Dental Association v. FTC*, 526 U.S. 756 (1999) at 780.

Here the court, with reference to *P. Areeda*, indicates that the extent of a reasonableness inquiry depends on the circumstances. This is elaborated on in the subsequent passage, where the court stated that

As the circumstances here demonstrate, there is generally no categorical line to be drawn between restraints that give rise to an intuitively obvious inference of anticompetitive effect and those that call for more detailed treatment. What is required, rather, is an enquiry meet for the case, looking to the circumstances, details, and logic of a restraint. The object is to see whether the experience of the market has been so clear, or necessarily will be, that a confident conclusion about the principal tendency of a restriction will follow from a quick (or at least quicker) look, in place of a more sedulous one. And of course what we see may vary over time, if rule-of-reason analyses in case after case reach identical conclusions.²⁴⁶

Thus, the scope of inquiry is dependent on experiences with the effects of the conduct under scrutiny, which was also the topic in determining whether some conduct should be subject to *per se* treatment. The more confidence in the effects of some conduct, the less is the need for an initial assessment of the evidence of the case. The conduct can be said to be subject to an *a priori* assessment of the anticompetitive effects. The stronger the *a priori* probability of harmful effects, the less is the need for an initial inquiry of actual evidence of harmful effects. This is in line with rational evidence assessment, which will be discussed in Chapter Five. A quick look creates a presumption that shifts the burden of proof to the defendant.²⁴⁷ If the defendant manages to present evidence of efficiencies, a more careful inquiry is necessary. From a dynamical perspective, this case contributes to new learning, making it possible to do more precise *a priori* assessments in the future.

Thus, instead of talking about standards and rules and preciseness of rules, we can talk about presumption rules that become more precise as we learn more about different kinds of conduct. The probability of anticompetitive effects seems to be the main factor in the actual determination of the presumptions. The confidence in anticompetitive effects as a basis for the legal rules contributes to less expected error losses in a decision theoretic sense. However, there are other determining factors for both the choice between rules and standards and the optimal precision of rules.

The consequences of errors should also be taken into account, as described above. Furthermore, by abandoning a categorical distinction between rules and standards by

²⁴⁶ *California Dental Association v. FTC*, 526 U.S. 756 (1999) at 780-781.

²⁴⁷ See Gavil (2008) for the same point of view.

abandoning a clear distinction between per se and rule of reason regulations, the benefits of rules are lost. If there is always room for an individual assessment, then the application costs saved from precluding such individual assessments are lost. Utilizing presumptions instead of individual assessment in each case will, however, realize some application cost savings associated with standards. Getting more and more precise presumption rules may reduce the expected errors in individual cases, but the increased costs of complexity should also be taken into account. This complexity might also be detrimental to legal certainty. Furthermore, leaving the floor open for arguing for a more precise rule in every case facilitate rent-seeking. Thus, even if one of the imperative factors in rational rules is taken into account, namely the probability of error, more factors should be considered if one wants to obtain rational rules.

Briefly about merger control

Mergers are, in general, assessed according to an effects standard as described in the legal framework chapter above. The importance of always having the standard in mind in assessing mergers was illustrated by *Brunswick*,²⁴⁸ which was a private merger suit. In *Brunswick*, a competitor tried to challenge a merger claiming damages for the increased competition resulting from the efficiencies created by the merger. The merger created a more efficient competitor. The court stated that this was not antitrust injury and refused the plaintiff standing.

Mergers are, in general, likely to create efficiencies. Thus, most mergers should be assessed according to a standard. Merger control is, in general, of another nature than enforcing violations as mergers are often challenged by public enforcement authorities in ex ante control. The result is that merger control is usually not subject to punitive remedies, but rather to less judgmental regulatory remedies.

In merger control, it is often not a question of total prohibition or clearance but more about finding acceptable measures that suitably address the anticompetitive concerns. This need for flexibility speaks for assessing mergers according to a standard. It might be that more or less precise per se violations could have merits in a few areas of merger control such as horizontal mergers between the largest firms in a market. However, it is outside the scope of this study to determine if that would actually be rational.

Presumptions are utilized to achieve efficiency in merger control. The determination of the presumption rules used in US merger control has not been subject to the same

²⁴⁸ *Brunswick Corp. v. Pueblo Bowl-O-Mat, Inc.*, 429 U.S. 477 (1977).

principled debate as the regulation of market conduct, as described above. The most widely used presumptions are found in the horizontal merger guidelines,²⁴⁹ where concentration level and increase in concentration level is used to screen mergers that are not likely to raise anticompetitive concerns.

Thus, as with the violations, the use of presumptions is the assessment principle used in merger control. Still, merger control seems to be more flexible with less prefixed presumptions than in the enforcement of the violations.

4.2.5 Rules, standards, and precision in EU competition law

Object versus effects

TFEU Article 101, which prohibits anticompetitive cooperation between undertakings, does not distinguish between per se violations and rule of reason violations as in the US. However, TFEU Article 101 operates with a separation between cooperation that restrict competition by object and cooperation that restrict competition by effect. Object restrictions are presumed to be anticompetitive, leaving it to the parties to prove any beneficial effects according to TFEU Article 101 (3). Thus, the legality of the conduct having as its object to restrict competition is still assessed according to a standard, but the burden of proof is switched to the party. In *Consten and Grundig*, the ECJ stated this as

*[F]or the purpose of applying Article [101(1)], there is no need to take account of the concrete effects of an agreement once it appears that it has as its object the prevention, restriction or distortion of competition.*²⁵⁰

In the same decision, the ECJ characterized an object restriction by clauses that “*reveal the effect on competition to be sufficiently deleterious.*” More recently, in *BIDS and Barry Brothers*, the ECJ distinguished object and effect restrictions by the following statement:

*The distinction between „infringements by object” and „infringements by effect” arises from the fact that certain forms of collusion between undertakings can be regarded, by their very nature, as being injurious to the proper functioning of normal competition.*²⁵¹

Thus, those restrictions that are sufficiently likely to be anticompetitive without further scrutiny are considered to restrict competition by object. However, it seems that the ECJ will

²⁴⁹ Horizontal Merger Guidelines (August 19, 2010) Section 5.3.

²⁵⁰ Joined cases 56 and 58/64 *Consten and Grundig v Commission* [1966].

²⁵¹ Case C-209/07 *Competition Authority v BIDS and Barry Brothers* [2008] Para 17.

not accept a pure abstract approach to whether a restraint under scrutiny restricts competition by object. The ECJ has stated that the object classification of a specific restraint under scrutiny can be rebutted by an assessment of the “*the economic context in which the agreement is to be applied.*”²⁵² In the *GlaxoSmithKline* saga, the CFI stated that whether the deprivation of advantages to consumers could be presumed by the conduct in question should be included in the assessment of the context of the agreement. However, this was refuted by the ECJ.²⁵³ In addition to the statements of the courts, the European Commission’s guidelines on the application of TFEU Article 101 (3),²⁵⁴ Section 21 states that

Restrictions of competition by object are those that by their very nature have the potential of restricting competition. These are restrictions which in light of the objectives pursued by the Community competition rules have such a high potential of negative effects on competition that it is unnecessary for the purposes of applying Article 81(1) to demonstrate any actual effects on the market. This presumption is based on the serious nature of the restriction and on experience showing that restrictions of competition by object are likely to produce negative effects on the market and to jeopardise the objectives pursued by the Community competition rules.

As mentioned in Chapter Two, it has been argued that the EU may have something similar to per se prohibitions in the application of TFEU Article 102.²⁵⁵ Examples are selling below cost²⁵⁶ and exclusive supply agreements and pricing practices with similar effects.²⁵⁷ There is no established criteria determining what would qualify as a per se violation of TFEU Article 102 since it is not even settled that there are such per se violations. It is more likely to assume that there are factual presumptions that may switch the burden of proof to the dominant firm in the same way that a restriction by object switches the burden of proof according to TFEU Article 101.²⁵⁸ In *Michelin*, the General Court stated that:

*If it is shown that the object pursued by the conduct of an undertaking in a dominant position is to limit competition, that conduct will also be liable to have such an effect.*²⁵⁹

²⁵² Joined Cases 29/83 and 30/83 Cram and Rheinzink v. Commission [1984] Para 26.

²⁵³ *GlaxoSmithKline Services Unlimited v Commission* Case C-501/06 etc. ECJ [2010].

²⁵⁴ Communication from the Commission - Notice - Guidelines on the application of Article 81(3) of the Treaty Official Journal C 101, 27.04.2004, p. 97-118.

²⁵⁵ See also Bailey (2010).

²⁵⁶ *AKZO Chemie BV v Commission* Case C-62/86 [1991].

²⁵⁷ *Hoffmann-La Roche & Co. AG v Commission of the European Communities* Case 85/76 [1979].

²⁵⁸ See Bailey (2010) for the same argument.

²⁵⁹ *Manufacture française des pneumatiques Michelin v Commission of the European Communities* Case T-203/01 [2003] Para 241.

Thus, it seems like the distinction between object and effect also applies to TFEU Article 102. The criteria for a restraint to be considered to restrict competition by object according to TFEU Article 101 should then be applied to whether a restraint restricts competition by object according to TFEU Article 102.

As follows from above there is no categorical distinction between standards and rules in the application of TFEU Articles 101 and 102. However, TFEU operates with two categories, where one category includes those restraints presumed to be anticompetitive by object and one includes those restraints where the anticompetitive effects must be established. Furthermore, whether a restraint is in the object category must be considered in light of the circumstances of the restraint. This is comparable to the recent development in the US discussed above, where the specific circumstances of the restraints are relevant for determining *per se* violations and where the distinction between *per se* rules and rule of reason analysis has blurred into a system of presumption rules where the need for assessing the specific circumstances of the case is dependent on the confidence in the anticompetitive effects *a priori*.

However, there is at least a formal difference. While the courts in the US, according to recent practice, operate with a sliding scale, the EU operates with a categorical distinction between object and effect. However, despite the formal distinction between object and effect restrictions, it is likely to be a sliding scale. As described above, the “economic context” should be taken into account in the object assessment. This economic context is likely to be more crucial for offences on the border of the object category. On the other side, if some conduct in the effect category is *a priori* more likely to restrict competition, then less evidence will be necessary to establish that the conduct is anticompetitive. That said, the EU competition law enforcement has been criticized for being rigid and form based, which may indicate that this sliding scale is not as sliding as it should be, especially in the application of TFEU Article 102.²⁶⁰ This critique was met by a discussion on a more economic approach illustrated by the European Commission discussion paper on exclusionary practices²⁶¹ from 2005.²⁶²

It is difficult to say whether the European Courts actually have pursued such a more economic approach. Some recent decisions may indicate that a transition towards a more

²⁶⁰ See Christiansen and Kerber (2006) and Geradin and Petit (2010).

²⁶¹²⁶¹ DG Competition discussion paper on the application of Article 82 of the Treaty to exclusionary abuses, Brussels, December 2005.

²⁶² See Christiansen and Kerber (2006).

economic approach may take some time. In *Tomra*,²⁶³ the General Court stated that the analysis of actual effects were not necessary where the European commission had performed such an effect analysis. The object category presumptions in the EU seem to be more settled than those restraints that are in the per se category in the US. Some per se violations that are abandoned in the US, such as the per se treatment of certain vertical restraints, remain in the EU as restraints considered to restrict competition by object.

By operating with a system of presumptions, it is always possible to refute the presumption according to the effects standard. In this way, one forgoes the full benefits associated with rules, which excludes the possibility of refuting the presumption, and hence saves some application costs.

The object category in EU competition law covers conducts that “*can be regarded by their very nature, as being injurious to the proper functioning of normal competition*”. On its wording alone, this seems to require less than being “*manifestly anticompetitive*”, which is the US counterpart. Still, it seems that, like in the US, the probability of anticompetitive effects is determining for whether some conduct belongs in the object category. Determining presumptions that correctly address anticompetitive conduct with sufficient confidence is the main principle in determining whether some conduct should be in the object category. Avoiding errors is the main factor. Other factors such as the consequence of errors, the costs of formulation and application, including rent-seeking costs are not explicitly stated as factors that should be taken into account. Thus, similar to US, even if one of the necessary factors for determining rational rules is taken into account, namely, the probability of loss from errors, more factors should be considered if one wants to obtain rational rules.

Block exemptions

In the enforcement of TFEU Article 101, so-called block exemptions may be issued by the Council or European Commission with delegated powers from the Council. A block exemption creates a safe harbor by giving a group of agreements the benefits according to Article 101 (3). For instance, it is issued a block exemption for certain vertical agreements and concerted practices.²⁶⁴ These block exemptions are relevant for the discussion on rules versus standards as safe harbors can be seen as rules that create a per se legality for certain

²⁶³ *Tomra ASA and others v. European Commission* Case T-155/06 [2010]. Upheld by the ECJ in Case C-549/10 P [2012].

²⁶⁴ Commission Regulation (EU) No 330/2010 of 20 April 2010 on the application of Article 101(3) of the Treaty on the Functioning of the European Union to categories of vertical agreements and concerted practices, Official Journal L 102 , 23/04/2010 P. 0001 – 0007.

types of conduct. However, the block exemptions do not fully create a *per se* legality as the European Commission and the national competition authorities may withdraw the benefits from a block exemption in a single case.²⁶⁵ Thus, the block exemptions are more like strong presumptions for legality. The legal basis for the block exemptions is TFEU Article 103 (2) b, which states that they shall be designed

to lay down detailed rules for the application of Article 101(3), taking into account the need to ensure effective supervision on the one hand, and to simplify administration to the greatest possible extent on the other.

Thus, the block exemptions are supposed to take into account effective supervision on the one hand and simplify administration on the other hand. This looks very much like the decision theoretic analysis of the choice between rules and standards discussed above. The term “*effective supervision*” must mean a supervision that does not create too many errors. Safe harbors are likely to include at least some harmful actions depending on how extensive the safe harbors are. Allowing these actions can be considered as type-2 errors. To “*simplify administration*” is to reduce the application costs. By relying on a safe-harbor, both the enforcers and private parties save the costs of an individual assessment. As the block exemption can be withdrawn in single cases, the full potential of cost savings is not realized; however, on the other hand, the worst type-2 errors can also be avoided. Since the block exemptions usually address conduct with very low chances of harmful effect it can probably be questioned as to whether the reduced risk of type-2 errors is worth the extra costs of operating with a presumption rather than an irrefutable rule. Formulation costs are not explicitly mentioned in TFEU Article 103 (2) as a relevant cost in considering block exemptions. If such costs are not taken into account, it is likely to be developed too many block-exemptions. However, since the European Commission has limited budgets, they are likely to, at least indirectly, take formulation costs into account when they consider producing block exemptions.

Briefly about merger control

In merger control, there is no separation between mergers that have as their object to restrict competition and mergers that restrict competition according to their effects. All mergers are

²⁶⁵ See Regulation 1/2003 (Council Regulation (EC) No 1/2003 of 16 December 2002 on the implementation of the rules on competition laid down in Articles 81 and 82 of the Treaty Official Journal L 1, 04.01.2003, p.1-25) article 29.

assessed according to its effects. The merger control in the EU is, however, interesting from a rule versus standard perspective. The standard for merger review changed from a “creating or strengthening a dominant position” test (dominance-test) in the previous merger regulation²⁶⁶ to a “significant impediment of effective competition” test (SIEC-test) in the present merger regulation²⁶⁷ (EMR). The dominance-test can be said to be more a rule-based test while the SIEC-test is a more standard-based test. One of the main reasons for this change was the assumed expected errors that were likely to be associated with the dominance test. In particular, the risk of under-inclusiveness (failing to condemn harmful mergers) was associated with the dominance-test as the test was alleged to not include mergers between non-dominant companies that still were likely to be harmful from an oligopoly point of view.²⁶⁸ From the debate surrounding the merger review standard,²⁶⁹ it appears that reducing expected error from under-inclusiveness was the main force leading to the changes. Opponents partly argued that the dominance-test was sufficiently flexible and that it provided legal certainty. Thus, many of the decision theoretic relevant factors were involved in the debate.

As in the US, the presumptions used in merger control are not as settled as for the prohibition provisions discussed above. This is natural since the SIEC-test is relatively new in the EU. In the horizontal merger guidelines,²⁷⁰ concentration indexes are used to screen off mergers that are unlikely to create harmful effects. Usually, it will be the merging parties that have the burden of proof in proving efficiencies that offset the anticompetitive effects alleged by the European Commission.

Guidelines

Enforcement authorities will typically present their interpretation of rules in guidelines. However, when inquisitorial bodies like the European Commission produce guidelines, they have a particular authoritative role since they are also decision makers. Inquisitorial bodies can determine rules in guidelines with the confidence that they have the power to use these rules in their own decisions. The European Commission has developed a substantial amount

²⁶⁶ Regulation 1310/97 OJ [1997] L 180/1.

²⁶⁷ Council Regulation (EC) No 139/2004 of 20 January 2004 on the control of concentrations between undertakings (the EC Merger Regulation) Official Journal L 24, 29.01.2004, p. 1-22.

²⁶⁸ See Whish (2009) p. 853

²⁶⁹ See, for instance, Whish (2009) p. 851-856 for a description of the debate.

²⁷⁰ Guidelines on the assessment of horizontal mergers under the Council Regulation on the control of concentrations between undertakings (2004/C 31/03).

of guidelines. These include guidelines on the application of TFEU Article 101 (3),²⁷¹ guidelines on horizontal agreements,²⁷² guidelines on vertical restraints,²⁷³ guidelines on horizontal mergers,²⁷⁴ and guidelines on non-horizontal mergers.²⁷⁵

In the guidelines on horizontal agreements, Section 1.1 (7), the European Commission state that

[g]iven the potentially large number of types and combinations of horizontal co-operation and market circumstances in which they operate, it is difficult to provide specific answers for every possible scenario. These guidelines will nevertheless assist businesses in assessing the compatibility of an individual co-operation agreement with Article 101. Those criteria do not, however, constitute a 'checklist' which can be applied mechanically. Each case must be assessed on the basis of its own facts, which may require a flexible application of these guidelines.

Similarly, in the guidelines on vertical restraints, Section I.1 (3), the Commission states that

[b]y issuing these Guidelines, the Commission aims to help companies conduct their own assessment of vertical agreements under EU competition rules. The standards set forth in these Guidelines cannot be applied mechanically, but must be applied with due consideration for the specific circumstances of each case. Each case must be evaluated in the light of its own facts.

Thus, the purpose of the guidelines is allegedly to provide legal certainty to the companies.

Despite the possible good intentions, these guidelines may not be an improvement from a decision theoretic point of view. First, even though the guidelines stress the consideration of specific circumstances, the guidelines can be argued to turn the standards into rules. It might be that, in many cases, it is easier to relate to the antitrust standard than the guidelines. For some companies, it might be easier to assess whether their conduct actually restricts competition, than to scrutinize a substantial amount of guidelines. Furthermore, in addition to the problem of turning standards into specific rules, these guidelines can reflect a non-optimal level of detail in increasing the complexity costs.

²⁷¹ Communication from the Commission - Notice - Guidelines on the application of Article 81(3) of the Treaty Official Journal C 101, 27.04.2004, p. 97-118.

²⁷² Communication from the Commission - Guidelines on the applicability of Article 101 of the Treaty on the Functioning of the European Union to horizontal co-operation agreements Official Journal C11, 14.1.2011, p. 1.

²⁷³ Commission notice - Guidelines on Vertical Restraints Official Journal C 130, 19.05.2010, p. 1.

²⁷⁴ Guidelines on the assessment of horizontal mergers under the Council Regulation on the control of concentrations between undertakings Official Journal C 31, 05.02.2004, p. 5-18.

²⁷⁵ Guidelines on the assessment of non-horizontal mergers under the Council Regulation on the control of concentrations between undertakings Official Journal C 265 of 18/10/2008.

Enforcement authorities, especially those under supervision by political authorities, might, as described above, be vulnerable to rent seeking activities that can result in non-optimal guidelines. Furthermore, enforcement authorities are often measured on what they do and not on what they do not do. This might mean that the enforcement authorities are more concerned about avoiding type-2 errors than avoiding type-1 errors. As a result of this, more precise rules presented by enforcement authorities are not necessarily more correct rules from a decision theoretic point of view. The impact of the decision makers' incentives in the evolution of rules is addressed further below.

Thus, from a decision theoretic rational point of view, it can both be questioned whether the guidelines really provide legal certainty and whether the European Commission has the correct incentives in formulating the guidelines.

4.2.6 Discussion and critique

It is all about presumptions

After the discussion of the actual implementation of rules, standards, and precision level in US antitrust law and EU competition law, it appears that the assessment principles applied are not as different as might appear at first sight. The distinction between per se and rule of reason in the US has developed into an increasingly blurred system of presumption rules. The stronger the a priori belief that some conduct has anticompetitive effects, the less evidence of actual circumstances is needed to establish a presumption of anticompetitive effects. The EU competition rules have always operated by a system of presumptions where conduct considered restricting competition by object creates a presumption of harmful anticompetitive effects, while other conduct must be assessed according to its effects. However, the scope of the inquiry is dependent on the circumstances of the restriction, which, in practice, is blurring the distinction between object and effect restrictions. Conduct on the border of the object category will normally require more inquiry into the circumstances of the restriction to establish a presumption of harmful effects, while some conduct close to the object category will require less inquiry of the actual circumstances than some conduct very different from those in the object category.

Both theory and actual learning are important in assessing the confidence of anticompetitive effects used in determining the presumption rules. As a matter of observation it seems that EU operates with stricter presumptions than in the US.

Standards versus rules versus precision level

By operating with presumptions that always potentially may be refuted, both the US and EU apply a legal standard in antitrust analysis. Thus, an assessment according to a standard is preferred to a rule-based approach for all sorts of conduct. This excludes the possible benefits associated with rules in terms of reduced application costs. This is in line with statements from the courts in both the US and the EU, in both of which confidence in anticompetitive effects and not application costs seems to be the most important factor in the determination of the legal rules. This can be criticized not because it is necessarily wrong to always operate with at standard, but because the benefits of pure rules do not seem to have been sufficiently considered.

However, by creating presumption rules as described above, one can at least realize some of the benefits associated with rules within the standard assessment framework. Individual assessments are replaced by presumptions that may be refuted. Correct use of presumptions will contribute to rationality in evidence assessment. This will be further stressed below and discussed in more detail in Chapter Five. The theory of rational precision level of rules also applies to presumption rules. With presumption rules, the choice between rules and standards is replaced with the choice of optimal precision level of the presumption rules. More precise presumption rules are likely to facilitate fewer errors, but more preciseness is also associated with higher formulation costs and application costs.

Are the losses from erroneous decisions properly taken into account?

The confidence in the anticompetitive effects of certain practices is one relevant factor in assessing the expected loss from errors of a legal rule. This says something about the probability that some type conduct has anticompetitive effects and then the probability of falsely condemn benign behavior or falsely accept harmful behavior. With high confidence in the anticompetitive effects, these probabilities are low. However, the consequences of making a wrongful decision are also relevant in making a rational decision. Even if there is a high probability that some conduct has anticompetitive effects a priori, it might still be rational to do an in depth inquiry into the actual effects if the negative consequences of making a wrong decision are sufficiently high. Thus, the consequences of making errors should be taken into account in the considerations. This is not explicitly taken into account in the criteria established by the courts, in either the US or the EU. The courts focus on the confidence in harmful effects and not the consequence of making mistakes. It might be that those kinds of conduct that are assumed to almost always have anticompetitive effects are not likely to have

large positive effects anyway in those few occasions the effects are not negative. This reduces the consequences of not taking errors into account. However, this might not always be the case, especially in abuse of dominance cases. Condemning conduct that is likely to be anticompetitive but may facilitate innovation in a few occasions may have large negative consequences. Thus, if the courts want to state rational legal rules the consequences of errors should be taken into account in the assessment of how much inquiry into the actual circumstances of the case is necessary.

Are the costs of formulation and application properly taken into account?

The costs of formulation and application are important factors in determining rules. It costs more to formulate more precise rules. The presumption rules have two opposite effects on application costs. Since presumption rules partially replace individual assessments, application costs are saved. Thus, some of the variable cost savings associated with rules are implemented with the presumption rules. On the other hand, as the presumption rules becomes more and more precise, complexity costs arise, requiring more and more inquiry into the factual circumstances to determine which presumption rule applies.

The tradeoff between the different costs is not explicitly mentioned by the courts in the decisions referred to above. Whether the decision makers have the proper incentives to incur all the fixed cost to formulate the correct rule depends on the organization of the process. This will depend on how much they will benefit from the reduced costs of application in the future. In this context, one should believe that inquisitorial specialized decision makers have stronger incentives, maybe too strong, to incur the costs of developing rules to save application costs later compared to courts that occasionally have an antitrust case. However, the incentives to develop more precise presumption rules stops at some point where the preciseness means that too many individual factors must be taken into account. The incentive to reduce application costs may be a partial explanation for why the EU seems less keen to abandon rules that are abandoned in US. It might also explain the development of the extensive body of guidelines in the EU. The issue of incentives in the development of rules is returned to below. For now, it is sufficient to conclude that neither the courts in the US or the EU seem to explicitly point at all the relevant costs to be taken into account in the determination of the presumptions rules.

Rent-seeking

An indirect cost that was explained in the decision theoretic analysis above is that of rent-seeking. A benefit of rules compared to standards is that they are less prone to rent-seeking activities in the application of the rules. This is a benefit that may tip in favor of a rule in the choice between rules and standards. The rules, on the other hand, are more prone to rent-seeking activities when they are determined. If it is public that there is some chance that the decision maker will establish some new rule in a case, this might draw a lot of attention to the case from parties affected by the rule. Affected parties have the incentives to incur substantial costs to influence rules to be determined according to their preferences. With presumption rules, rent-seeking is likely to be large at both the formulation stage and the application stage. The rent-seeking aspect does not seem to be a factor explicitly taken into account by the US or EU decision makers when they determine presumption rules.

There are limited opportunities to influence the courts outside the formal frames of litigation. A specific case is necessary to have a rule determined. An inquisitorial enforcement authority decision maker such as the European Commission might be an easier target for rent-seeking as they also may state rules in guidelines. The issue of rent-seeking will be revisited under in the discussion on the institutional factors in the evolution of rules below.

Legal certainty

As discussed above, rules have some advantages compared to standards in providing legal certainty. This also applies to presumption rules. There are some limits to the legal certainty provided by rules, as discussed above. If rules become too complex and costly to learn, this may threaten legal certainty. In some cases, it may provide more legal certainty to adhere to a standard than to a complex set of legal rules. For instance, if a business manager wonders if their exchange of information is legal or not, it may be easier for them to relate to the question of whether their exchange is likely to restrict competition rather than relating to a complex body of rules.

Legal certainty is not an explicit factor stated by the courts to be taken into account in the determination of presumption rules.²⁷⁶ Still, as providing legal certainty is one of the roles of the courts, it is natural that providing predictable rules is one of those things judges take into account in determining rules. However, it should be noted that it is not likely that the courts will take into account the complexity of the legal system in general by asking

²⁷⁶ As discussed above it is an explicit factor the European Commission take into account when they produce guidelines.

themselves whether the rules they make tip the body of rules into too much complexity. Judges are probably most concerned with finding the correct rule to apply on the facts in question. The rationality in the evolution of legal rules will be discussed in more detail below.

More instruments used in the EU

In the EU, a wider range of tools are employed in determining rules. First, the EU has a formal system of block exemptions that formally create strong presumptions of legality. Even if the presumption of legality is the general main rule, as it is the interference with private actions that need a justification, the block exemptions are likely to have an impact in practice. According to TFEU Article 103 (2), balancing errors and costs is the purpose of block exemptions. The block exemptions can be said to be quite complex. For instance, many block exemptions operate with exemptions from the block exemptions for so-called hard-core restraints. Furthermore, complex calculations are often necessary to identify the market shares that determine if a block exemption applies. Therefore, it can be asked whether these block exemptions contribute to reduced application costs. As just stated, most practices covered by the block-exemptions are quite clearly not anticompetitive anyway, and it may be easier to just relate to the likely anticompetitive effects directly. Taking into account the administrative and political cost associated with formulating these block exemptions, the net benefits might well be negative.

The European Commission also applies another authoritative instrument in the determination of rules: the guidelines. Although guidelines are also produced by the US enforcement authorities, they have another authority when they are coming from an inquisitorial decision body subject to a limited judicial review, as in the EU.²⁷⁷ The European Commission has the power to make its actual decisions in line with the rules stated in the guidelines. Furthermore, as private enforcement has a lesser role in the EU than the US, the European Commission has a stronger influence on the evolution of rules. The evolution of rules will be discussed in more detail below. As discussed above, a purpose of the EU guidelines is to provide legal certainty and thereby reduce the assessment costs for the businesses affected by the rules. As for the block exemptions, it is legitimate to ask whether guidelines serve this purpose. For instance, assessing the likely anticompetitive effects of a

²⁷⁷ The FTC could in principle produce guidelines with the some of the same normative value. Even the FTC follows an adversarial procedure in front of an administrative law judge, this decision is subject to review by the Commission. The FTC doesn't seem to have produced guidelines to the same extent as the European Commission though. See Posner (2011) p. 858 for a discussion on the production of guidelines by US enforcement agencies.

horizontal agreement may be easier than assessing the conduct according to the complex rules and the many reservations in the guidelines on horizontal agreements. Taking into account the enormous amount of resources used to produce these guidelines, it is difficult to be confident in the rationality of these guidelines.

4.3 Jurisprudence and the evolution of rational antitrust rules

4.3.1 The principle of precedence

In most legal systems, court decisions evolve into precedence, especially Supreme Court decisions.²⁷⁸ In inquisitorial systems such as the enforcement of EU competition law by the European Commission, unchallenged enforcement practice is also used as precedence. However, enforcement practice lacks the same authoritative precedential value as Supreme Court decisions, though.

Experiences from earlier decision making can be seen as accumulated information capital. The principle of precedence involves utilizing the information capital gained by previous decisions.²⁷⁹ By applying the same rule on similar factual circumstances as in earlier decisions, one saves the cost of performing a similar assessment, which is likely to lead to the same decision again. The principle of precedence may also deter judges and enforcers from corruption or other non-relevant influences since far more people scrutinize a decision for its precedence value than for its value in solving the specific case.

The principle of precedence is the mechanism that makes the decision makers of specific cases able to determine rules to be applied in later cases. If the courts want to replace a standard by a rule or want to create a more precise rule as described in the previous subchapter above, the courts ability to create precedents is the principal instrument to achieve this. Thus, the actual cases to be decided provide the basis for the development of rules. Inquisitorial enforcement authorities, such as the European Commission are not bound by the constraints of having a suitable case at hand in the determination of rules, as they can state their interpretation of the rules in guidelines.²⁸⁰

The principle of precedence can be further specified as the doctrine of *stare decisis*, usually associated with common law systems, and as the doctrine of *jurisprudence constante*,

²⁷⁸ See MacCormick and Summer (1997)

²⁷⁹ See Posner (2011) p.743 f. and Kaplow (2000).

²⁸⁰ The US FTC could in principle produce guidelines according with some of the same authoritative value. The FTC follows an adversarial procedure in front of an administrative law judge, but the decision is subject to review by the Commission. The FTC doesn't seem to have produced guidelines to the same extent as the European Commission. See Posner (2011) p. 858 for a discussion on the production of guidelines by US enforcement agencies.

usually associated with civil law systems.²⁸¹ In the doctrine of *stare decisis*, a legal rule established in one case serves as a binding authority for the legal rule to be applied in later similar cases.²⁸² Under the doctrine of *jurisprudence constante*, the courts are only bound to follow a rule established by a consolidated trend of decisions. Legal decisions are not established as an authoritative source of law before they mature in to a prevailing line of precedents.²⁸³ For the purpose of this study, a principled discussion on exactly how many consistent decisions are necessary to establish a legal rule in the US or the EU is avoided. This is dependent on many factors and is beyond the scope of this study. However, in line with Posner (2011), it is assumed that a single precedent is a “fragile thing that easily can be distinguished away.”²⁸⁴ Thus, a precedence-based rule becomes stronger as more and more decisions confirm the rule.

Below, it is discussed as to how the principle of precedence influences the evolution of rational antitrust rules. This will be done by addressing three aspects of precedence-based rule making. One aspect is path-dependence. An obvious disadvantage of precedence is that if the decisions that form the basis for the precedence-based rule are wrong, this error may ripple into future decisions. The second aspect addressed is the role and consequences of analogical reasoning. No cases are equal, and it will almost always be necessary to interpret the existing legal rule to decide if it applies to the case at question. In this interpretation analogy is imperative as a practical method of legal reasoning. Thus, the principle of analogical reasoning influences the evolution of rules. The relationship between precedence and standard of proof is also addressed below. If facts in earlier cases are used to create a precedence-based rule that covers similar fact, this might interfere with the standard of proof.

In this subchapter, it is discussed how intrinsic properties of legal reasoning are likely to affect the evolution of legal antitrust rules. Thus, the discussion in this subchapter will not systematically take into account the incentives of the decision makers in this subchapter. The impact of the incentives of those who determine the antitrust rules is discussed in the next subchapter.

²⁸¹ See Fon and Parisi (2006).

²⁸² See Luppi and Parisi (2010) and Fon and Parisi (2006).

²⁸³ See Fon and Parisi (2006).

²⁸⁴ Posner (2011) p. 725

4.3.2 Precedence and path-dependence

Path-dependence is well known in evolutionary theory²⁸⁵ and economics.²⁸⁶ By path-dependence, one can be locked into inferior solutions due to historical circumstances. An example is the QWERTY organization of the keyboard that was once developed to prevent jam in mechanical typewriters.²⁸⁷ This precaution is unnecessary for electronic keyboards today. However, the switching costs associated with changing to an optimized keyboard system suitable for today's needs have created inertia towards an inferior keyboard construction that was once superior.²⁸⁸ The principle of precedence may facilitate a path-dependence which settles inferior legal rules.²⁸⁹ Rules that were once superior but no longer are, or that were wrong in the first place may have authority due to precedence. The likely effects of path-dependence depend on the impact of the self-reinforcing effects of precedence and the availability of correction mechanisms that may correct undesirable path-dependence.

The self-reinforcing effects of the principle of precedence in establishing rules have been studied in the law and economics literature.²⁹⁰ This is partially a question of the incentives of the judges and the decision makers to adhere to precedence. Below, it will be shown that judges may have strong incentives to adhere to the principle of precedence. Here, it will be discussed whether the mechanism of precedence itself is likely to facilitate a case-selection that reinforces the precedence.

The incentives to litigate and the case selection under the principle of precedence are studied in law and economics.²⁹¹ The incentives to litigate a liability rule are assumed to depend on the stakes in question and the strength of the precedence based rule that regulates the issue. The plaintiff decides if he wants to litigate. The incentive to litigate to establish a liability is higher the higher the possible gain if liability is established, the higher probability that liability is established, and the lower the potential loss if the case is lost. Thus, the incentive to litigate is higher the higher the gain to loss ratio and the higher the probability of liability.²⁹² The probability of liability is dependent on, *inter alia*, the consolidation of precedence establishing the liability rule. The stronger the consolidation of precedence, the

²⁸⁵ In biology path dependence is also known as inertia, See Sober (2008) p. 243 f.

²⁸⁶ See Arthur (1988,1989).

²⁸⁷ See David (1985).

²⁸⁸ One such switching cost is that everybody must learn the new system which will reduce productivity in the learning phase.

²⁸⁹ Roe (1996), Rubin (2000) and Posner (2007) p. 753.

²⁹⁰ See *inter alia* Fan et al. (2005), Fon and Parisi (2006), Luppi and Parisi (2010) and Marciano and Khalil (forthcoming).

²⁹¹ See, for instance, Priest and Klein (1984) and Fan and Parisi (2005).

²⁹² See Fan and Parisi (2005).

more probable is it that the courts will establish liability in a new case. This will further strengthen the precedence-based rule.

Let us first assume that the consolidation of precedence is so weak that the liability rule is not likely to be consolidated further in a new case. This weakness might, for instance, follow from academic critic against the rule and dissenting opinions in the precedence-based rules. This means that the courts are not likely to make a decision that strengthens the precedence-based liability rule. It will only be rational to litigate under such circumstances if the gain loss ratio is sufficiently high, since the probability of winning is low. If such a case is litigated, this is likely to lead to a further weakening of the precedence-based rule. Thus, in the end, the rule will be abolished if it is used as a basis for litigation. Litigation requires a high gain to loss ratio for somebody to have the incentive to litigate. If not litigated, the rule will just stand there as a weak rule until it becomes so old that it eventually loses its precedential power for that reason.

Next, let us say that the precedence is already consolidated and that the rule is strong. Then, it is rational to litigate even when the gain to loss ratio is low. This litigation is likely to reinforce the strength of the rule, leading to an even more consolidated precedence. Thus, as a conclusion we can say that a strong precedence-based rule is likely to be reinforced. The reason is that the incentives to litigate on the basis of a strong rule are high. The incentives to litigate a weak rule are weaker since it requires more for such litigation to be profitable. Weak precedence-based rules are only likely to be abandoned quickly if someone has sufficient incentives to litigate. The weaker the liability-based rule, the weaker the incentives to enforce it by litigation. Thus, almost paradoxically, the weaker the liability rule, the less likely it is that the court will get chances to challenge it. This means that there is an intrinsic self-reinforcing effect of precedence. Strong precedence is likely to be stronger, but weak precedence is not so likely to become weaker.

There is also a theory of strategic litigation²⁹³ in which influential litigators such as large companies and governments can choose the cases to litigate and settle in order to strategically establish desirable precedence. In that sense there will be a bias in the evolution of precedence that will favor big litigators. The interest group influence on the evolution of legal rules will be returned to below.

The theory of path-dependence can probably explain some of the evolution of antitrust rules in the US and EU, and, even more importantly, the theory can explain some significant

²⁹³ See Spier (2007) and Sanchirico (2007) for a survey.

differences between the evolution of rules in the US and EU. In the US, private litigation is important for the development of rules. Private enforcers are driven by private gain, not the social benefits of the rule as such. Thus, private parties may have incentives to sue for the benefit from practices such as minimum resale price maintenance, even if such practice is no longer considered suitable for antitrust liability. The skepticism towards antitrust liability for such practices has resulted in a gradual abolition of antitrust liability for resale price maintenance, ending with the *Leegin*²⁹⁴ decision, where the per se prohibition of minimum resale price maintenance was abandoned. Thus, the precedence prohibiting minimum resale price maintenance could be considered as having gradually weakened until its fall in *Leegin*. This weakening was only possible because somebody had the incentives to litigate the rule. This is different in the inquisitorial system in the EU, where the main development of law follows from public enforcement. If the European Commission does not see the merits of enforcing a rule, the incentives to enforce such rules are limited.²⁹⁵ The result is that the rule is not challenged and the courts have no opportunity to abandon it.

4.3.3 Precedence and analogical reasoning

Precedents are based on facts from former cases. In theory, we can think of the creation and use of precedence in terms of induction and deduction. A general rule established by precedence is created by induction of similar cases, and the principle of deduction is used to decide if that rule applies to the facts of a new case.²⁹⁶ As deduction and induction are the established methods of scientific reasoning, legal scholars have advocated that these methods apply in legal reasoning.²⁹⁷ However, even if deduction and induction may be scientific ideals, they may not be very descriptive for practical legal reasoning. The facts of a new case are not likely to be so similar to the facts of the former cases that form the basis for the precedence-based rule that the principle of deduction can be used directly in the application of the rule in the new case. Some interpretation of the rule is necessary for the rule to be applied in the new case. In practical legal reasoning, the principle of analogy is an imperative method

²⁹⁴ *Leegin Creative Leather Prods, Inc. v. PSKS, Inc.*, 551 US 877 (2007).

²⁹⁵ There have indeed been a few cases regarding Resale Price Maintenance enforced by the European Commission. A Survey is given in OECD (2008). However, in the cases regarding Resale Price Maintenance this price policy have been practiced in combination with other restraints such as restrictions on parallel trade, territorial restrictions, exclusivity and in conjunction with horizontal agreements. Thus, courts have had few chances to challenge Resale Price Maintenance as a pure offence.

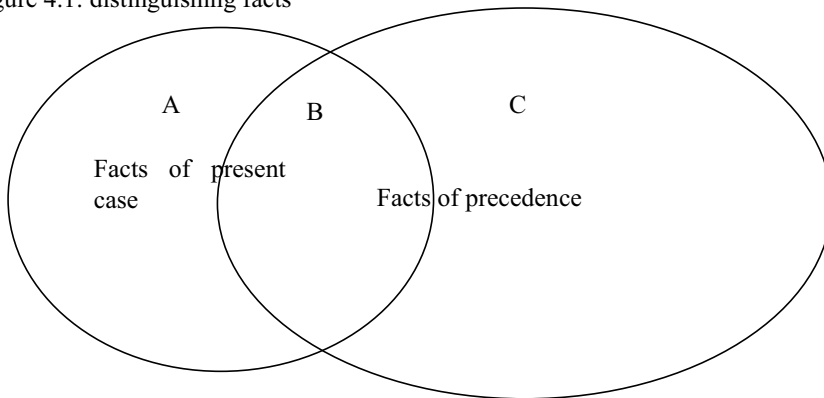
²⁹⁶ The principles of deduction and deduction will be discussed in detail in Chapter Five.

²⁹⁷ See Weinreb (2005) Chapter 1

in the interpretation of rules.²⁹⁸ Despite the use of analogy being alleged to lack scientific basis, it continues to be a major instrument for lawyers in interpreting the law. In the following it will briefly be discussed how analogical reasoning is likely to affect rationality in the determination of rules.²⁹⁹ It will be assumed that there is an underlying standard as in antitrust. From this standard, the courts have established a rule. This rule may be a presumption rule, as is usual in antitrust.

The facts from the cases that form the basis for the precedence-based rule must contain some similarities with the case in question so the principle of analogy can be used to derive the legal rule to be applied to the case in question. There are likely to be some factual differences though, since no cases are likely to be completely identical. These differences in facts might be crucial to the compliance with the underlying antitrust standard. This is illustrated in figure 4.1:

Figure 4.1: distinguishing facts



In Figure 4.1, area B illustrates the facts in the present case similar to those in former cases that provide the basis for the precedence-based rule. The areas A and C are factual differences that distinguish the present case from the facts in the cases that provide the basis the precedence-based rule. If area A is determining for whether the conditions in the standard are

²⁹⁸ See Weinreb (2005) Chapter 1. See also Posner (2008) p.180 f. for a discussion. The use of analogical reasoning can be considered as an abductive method, which is stressed by legal philosophers as the main method of reasoning in law. See Walton (2002). Abductive reasoning will be discussed in more detail in Chapter Five.

²⁹⁹ The use and performance of analogies to make inferences and make decision is has been subject to a substantial scrutiny. Analogies are important in contrastive inference and case based inference. Lipton (2004) argues that contrastive inference is central for the inference to the best explanation in the presence of complex evidence. Walton (2002) stresses the importance of analogies in the dialectical method used in legal argumentation. Gilboa (2009) studies the performance of case based decision making as an analogy-based practical method. The principle of analogical reasoning and the performance of analogical reasoning will be discussed in more detail in the chapter on rationality in evidence assessment.

met, then this should be caught by the principle of “distinguishing the facts” in the interpretation of the law. However, there might be a risk that the difference is not given weight if the differences are not discovered. The facts in area A might also not be given weight due to respect for the precedence as such. The decision makers’ incentive to adhere to the principle of precedence will be discussed below. If the factual differences, C, were not determining for the original decisions, we might not even know of them. C might still be relevant for the compliance with the standard if A is present. Thus, rules based on analogy should be avoided if they are based on cases where other facts, potentially, can change the compliance with the standard. This will typically be in areas with less experience concerning what circumstances are relevant for the compliance with the standard.

Furthermore, if the determination of the analogy-based rule ends up in an assessment of all the similarities and differences of the present case and the body of cases that constitute the precedence to determine the rule, then this is, in reality, an indirect way to check if the conditions in the standard are met. Furthermore, this may be as expensive as doing a fresh assessment against the standard. Thus, this might be a very imprecise and expensive way of assessing facts against the underlying standard.

Thus, analogies should be used critically. In antitrust law, analogical reasoning should always be performed in the context of the underlying standard. If an agreement between competitors to set up a joint selling unit is found illegal, it does not mean that an agreement to set up a joint purchasing unit for some input should be illegal, even if there are some similarities between the two situations. A quick look at the economics behind these two agreements reveals that their anticompetitive effects are likely to be quite different. Thus, the underlying antitrust standard and purpose quickly tells us that this is a bad analogy. The analogy becomes a method for finding candidate rules. We find some rule that seems to regulate a similar situation at a first glance, and then we can find out if this analogy-based rule really has merits by looking at the underlying standard and purpose of the rule.³⁰⁰ Thus, the underlying standard and purpose serve as a corrigendum for analogical reasoning. This works well if the underlying standard and purpose of the rule are clear. Using this principle will be more difficult in assessing an analogy based on a rule that is not rational in the first place, or where the purpose is ambiguous. How shall we, for instance, assess an analogy based on the prohibition³⁰¹ of minimum resale maintenance in the EU? If we don’t know what we want

³⁰⁰ See Weinreb (2005) chapter 1 and Posner (2008) p. 180 f. for a similar discussion on the role of analogies in the interpretation of rules.

³⁰¹ In terms of strong a strong presumption since resale price maintenance is in the object category.

with this rule, how shall we assess the merits of an analogy? Since the amount of such rules where the purpose is unclear seems to be larger in the EU than the US, as discussed above, this may indicate that potential failures associated with the use of analogy are more widespread in the EU than in the US. An illustrative example is as just mentioned prohibition of resale price maintenance. According to the EU guidelines of vertical restraints,³⁰² Paragraph 223:

agreements or concerted practices having as their direct or indirect object the establishment of a fixed or minimum resale price or a fixed or minimum price level to be observed by the buyer, are treated as a hardcore restriction.

Whether some practice has an indirect object of fixing a minimum resale price must be based on an analogy from fixing resale prices. The risk of irrationality of a rule resulting from such an analogy is high as long as we do not know the purpose of prohibiting resale price maintenance as such.

4.3.4 Precedence-based rules and the standard of proof

If precedence is used to create a rule from a standard, this might result in a circumvention of the standard of proof. Precedence-based rules are made from facts from previous cases. By using precedence, similar facts in new cases can be assessed against the rule instead of a fresh analysis of the facts against the underlying standard. Applying this rule instead of a fresh assessment might be used to circumvent the standard of proof by making it easier to establish a violation. This can best be illustrated by an example. Let us say that some agreement between firms is considered to restrict competition according to balance of probabilities in a case. This case creates precedence for a rule in the sense that similar agreements to the agreement in question are considered illegal. Let us now say that some firms have entered into a similar agreement according to balance of probabilities. This means that, most probably, the firms have entered into a similar agreement. In reality, this means that, most probably, there exists an agreement that most probably restricts competition. This might well still mean that it is most probable that the conduct in question does not restrict competition.³⁰³ If the conduct had been evaluated against the standard in the first place according to a standard of proof requiring balance of probabilities, the standard of proof might not be satisfied in the

³⁰² Commission notice - Guidelines on Vertical Restraints Official Journal C 130, 19.05.2010, p. 1.

³⁰³ Assume for instance that there is 60 percent chance that the conduct is present and that there is 60 percent chance that this conduct, if present, restricts competition. It is then 36 percent chance that competition is restricted.

assessment of the conduct in question. The result is that the chance of condemning behavior that is not anticompetitive increases. Thus, rationally the correct standard of proof should be adjusted to the rule in question.

A specific antitrust example is information exchange: for example, the exchange of capacity information. Assume that the exchange of capacity information is found to be an anticompetitive agreement. There is no dispute over the parties having agreed upon exchanging capacities. Let us say this case is used to create a rule that the exchange of capacity information is illegal. Now, let us assume that there is a new case where there is uncertainty whether there even was an exchange of capacities but it is considered to be more probable than not. In applying the new rule, this probable information exchange may be considered illegal. However, if the original rule was applied taking into account the uncertainty associated with both the existence of any information exchange and whether this exchange is anticompetitive, we are more likely to find that anticompetitive effects are not probable. By this mechanism, the principle of precedence may cause the antitrust rules to expand into areas where they have no merits.

In both US antitrust law and EU competition law, the rules established by precedence are presumption rules. It is always possible to refute the presumptions. Such presumptions partially replace the standard of proof. The initial burden of proof becomes to establish the presumption with sufficient confidence. Presumptions should ideally be used as an instrument for achieving rational evidence assessment. Both the presumption itself and the uncertainty associated with whether the presumption is established by the evidence in the case should be taken into account in the assessment of whether the standard of proof is satisfied. This is a question of whether the assessment of evidence is rational. These issues are discussed further in Chapter Five.

For now, it is sufficient to conclude that the principle of precedence creates a risk that the standard of proof is circumvented, with a resulting undesirable expansion of antitrust rules. This is, in particular, a risk in antitrust, where an enormous body of rules has evolved from relative simple standards. The substantial amount of guidelines developed in EU, such as the guidelines on horizontal agreements³⁰⁴ and the guidelines on vertical restraints³⁰⁵ make this risk particularly present in EU.

³⁰⁴ Communication from the Commission - Guidelines on the applicability of Article 101 of the Treaty on the Functioning of the European Union to horizontal co-operation agreements Official Journal C11, 14.1.2011, p. 1.

³⁰⁵ Commission notice - Guidelines on Vertical Restraints Official Journal C 130, 19.05.2010, p. 1.

4.4 Institutional factors, incentives, and the evolution of rational antitrust rules

4.4.1 Decision makers as utility maximizers

Judges and other antitrust decision makers that determine the antitrust rules as a by-product of deciding cases are subject to personal preferences as every other person. Since the legal method cannot be used to objectively deduct the legal rule to be applied in a case, this leaves room for the influence of personal preferences of the decision makers on the decisions. A decision maker may intentionally make his decisions as much in line with his personal preferences as possible, or the decisions might unintentionally be biased by these personal preferences. A decision maker's preferences for alternative actions are dependent on the decision maker's net utility. With net utility in this context, is meant the utility of an action minus the personal costs and efforts of taking that action. An antitrust decision maker's net utility of taking alternative actions is affected by, *inter alia*, career opportunities, salary, recognition, political biases and not necessarily by an intrinsic preference to determine rational rules.³⁰⁶

Posner uses utility maximization to explain the incentives for judges to adhere to the principle of precedence.³⁰⁷ Using precedence saves the costs and efforts of fresh assessments, which provides an incentive to adhere to precedence. Furthermore, Posner argues for some kind of equilibrium, where every judge has some incentive to follow precedence since they create precedents themselves that they want other judges to adhere to. Thus, the judges have some interest in the preservation of the principle of precedence, and to maintain this, they must adhere to the principle themselves. Furthermore, judges are afraid either to have their decisions reversed by appeal or that legislators will intervene against the rule they determine, which would make it obsolete. This creates incentives to reduce risk by adhering to the principle of precedence. The decision makers' incentives to adhere to precedence contribute to the path-dependence associated with precedence. Posner also points out that decision makers in administrative enforcement authorities do not have equally strong incentives to follow the principle of precedence.³⁰⁸ They are not subject to the same equilibrium as judges.

A judge's or another antitrust decision maker's actions to maximize his net utility are likely to depend on whether the system is inquisitorial or adversarial. Furthermore, a decision maker's utility-maximizing actions are likely to depend on whether the decision maker is

³⁰⁶ See Posner (2008) p. 57 f. and Posner (2011) p. 725 f. for a discussion on what judges maximize

³⁰⁷ Posner (2008) and Posner (2011) p. 725 f.

³⁰⁸ Posner (2011) p. 852 and p. 858.

directly political appointed or whether the decision maker is appointed by political principals. Furthermore, the actions are likely to depend on whether the decision maker is an independent adjudicator or a bureaucrat in a hierarchic system.³⁰⁹ In addition, the utility-maximizing actions may be dependent on whether a decision maker is appointed for life or for a limited period, subject to, or not subject to, renewal.

The organization of the antitrust decision making is different in the US and EU as was described in Chapter Two. The first part of the EU decision procedure is inquisitorial, where bureaucrats prepare the decision to be decided by a commission of political appointed commissioners. This decision is subject to judicial review by independent judges subject to a limited standard of review. In the US, the antitrust decision making, as a main rule, follows and adversarial procedure, where the decision is decided by an independent judge appointed by politicians.³¹⁰ Thus, one should expect that the utility maximizing actions of the decision makers are likely to differ in the two systems.

Below, economic analysis is used to study the incentives of decision makers in the determination of antitrust rules and how those incentives are likely to affect how the rules are determined.

Often, it is not only one decision maker but several assembled in a court or commission who, together, determine the rule to apply in the case. The strategic interaction of the decision makers may also potentially affect the rationality of the resulting decision on what rule to apply. Thus, how the joint decisions of several decision makers are likely to affect the rationality of the resulting rules will also be briefly discussed.

4.4.2 Efficiency versus interest group influence

In the theory of public choice, there are two main theories on how rules become how they are: the efficiency hypothesis and the interest group theory. Note that it is assumed that the antitrust statutes are given, so the analysis here is restricted to the development of rules by decision makers in the actual application of antitrust law. This means that the rules are either determined by the courts when they decide cases at hand or in the context of the decision-making of an inquisitorial enforcement agency. Enforcement agencies have the additional

³⁰⁹ The analysis of what judges maximize in Posner (2008) p. 57 f. and Posner (2011) p. 725 f. is based on adversarial judges. Inquisitorial judges might also be compared to bureaucrats. There is extensive literature in the field of public choice on what bureaucrats maximize. Seminal contributions are Tullock (1965), Downs (1967), and Niskanen (1971). See also Mueller (2003) p. 359 f.

³¹⁰ Recall that we are concerned with the federal antitrust laws. Federal judges are appointed. On the state level judges are normally directly elected. For the FTC enforcement of the FTC-act, the case is presented to an administrative law judge and the case is finally administratively decided by the Commission, which is subject to judicial review.

instrument of being able to state their determination of rules in guidelines and similar documents without necessarily having a case at hand.

The efficiency hypothesis

The efficiency hypothesis of regulation stresses the long-run evolution of regulations towards efficiency.³¹¹ According to this theory, only regulations promoting efficiency will survive in the long run. If a rule initially came into place for a reason other than efficiency, it will later be applied in a way that promotes efficiency by the courts. The efficiency hypothesis is not clear on why there is an evolution towards efficient rules. However, the best argument is that efficiency increases the social surplus. Somebody will always earn from more efficient use of resources. By the definition of efficiency, they will gain more than those who lose. Thus, there will be surplus demand for more efficient rules. Another explanation is that legal rules evolve in jurisdictions in competition with each other. Those systems with the most efficient rules will prosper, while those systems with inefficient rules will lose in the competition with other systems.

There are several studies in law and economics that argue that precedence-based rules developed by courts are likely to be efficient.³¹² Rubin (1977) uses asymmetric stakes to argue for the efficiency of precedence-based rules. Litigation is usually a null-sum game where one party wins what the other party loses. However, when rules are inefficient, there might be dead-weight losses due to inefficiencies that would likely be eliminated with more efficient rules. This creates asymmetries in the stakes that encourage litigation. Thus, parties are more likely to litigate than to settle when the underlying rules are not efficient. This means that inefficient rules are more likely to be challenged and changed. Priest (1977) extends the analysis of Rubin (1977) by assuming that the stakes are higher for the party that has most to gain by efficient rules. Thus, the one who benefit from efficient rules is likely to spend more on litigation and, consequently, win the case. Thus, even if the judges have no preference for efficient rules, or even are biased against efficient rules, there will be an evolution towards efficient rules. There have been other studies with other assumptions providing additional theoretical support for the efficiency hypothesis given the

³¹¹ See Viscusi et al. (2000) p. 313 f.

³¹² See Posner (1974). Posner is a major contributor to the development of the efficiency hypothesis in explaining the evolution of precedence based rules either in common law or in the application of a statutory standard such as in antitrust. See Rubin (2000) for a survey of the theories.

assumptions.³¹³ However, as for many models, the sensitivity of the assumptions provides a problem for the real world informative value of the models. The efficiency hypothesis of precedence-based rules can be criticized on several grounds. The principle of precedence may be subject to path-dependence and other deficiencies, as discussed above. Furthermore, other theories predict that rules, including precedence based rules might be biased due to interest group influence. This will be discussed next.

Interest group influence

The interest group theory use interest group influence to explain why regulation and rules are how they are.³¹⁴ This theory is based on the general public choice theories on how political authorities decide, normally under the condition that they are agents for voters in a democratic system. Political elected decision makers act in self-interest and maximize their utility, which is dependent on political support measured in votes. To maximize the number of votes, a policy must be chosen to maximize support. Money is important for outreach and election campaigns. In this context, monetary support from interest groups is important.³¹⁵ This means that politicians must weigh the profit interests of industries supporting their campaigns against the effects on votes from consumers that want low prices. This tradeoff in protecting special interest groups and consumers is analyzed formally by Stigler (1971) and Peltzman (1976). Cooperation with interest groups can also be important for politicians for other reasons. A firm can, for instance, influence the votes of its employees, and a labor union can influence the votes of its members.

Becker (1983) modeled interest group influence as competition between many interest groups with conflicting interests. The interests of the group spending most on influencing will be most successful in having its interests implemented in the legislation. It is the relative levels of support that are important. If two opposing interest groups spend equally on support, they will cancel each other out. Thus, we have a game where the level of support from one interest group is dependent on the support of the other interest group. The result is dependent on which group that is best to organize and represent their interest to the legislator. Interest groups with a few wealthy members, but where each member is heavily impacted by some regulation, will presumably be better promoting their interests collectively than a large group

³¹³ See, inter alia, Luppi and Parisi (2010) and Marciano and Khalil (forthcoming) for recent references to the theory.

³¹⁴ The theory can at least be traced back to Olson (1965).

³¹⁵ With interest groups it is meant all organized units with common interest in the outcome. This can be affected firms and their related unions, user and consumer organizations, labor unions and voluntary organizations.

with many members where each member only suffers a minor impact. This might be the case even when the total impact on the bigger group is larger. The reason is that, in a group, each member will have an incentive to free-ride on the efforts on the others. If little is at stake for each individual separately, this “problem” might have substantial effects. How many consumers are, for instance, willing to incur much effort to promote some regulation that reduces a price by five percent, although the economic impact might be large for the group of consumers as a whole? This means that, according to the interest group theory, concentrated interests have more impact on regulations and legislation than dispersed interests do.

It is reasonable to believe, as a starting point, that interest-group influence by rent-seeking activities is more likely to affect political decision makers subject to re-election than independent judges not subject to re-election.³¹⁶ Influencing judges outside the procedural framework of the case easily becomes illegal, while much influence on politicians can be done legally by lobbying. However, some research suggests that adversarial courts are at least as likely to be influenced by interest-group influence as politicians.³¹⁷ The inquisitorial system is argued to be better than the adversarial system in terms of avoiding rent-seeking by special interests. It is argued that, in the inquisitorial system, the decision makers pursue some goal of finding the truth, and have incentives to do so in a cost-efficient way. In the adversarial system, no party has any interest in arguing for the truth as such, but rather for the facts that benefit them. The amount of resources to spend is delegated to the parties. This creates a playing field for the parties and interest groups that support the parties to spend a substantial amount of resources on rent-seeking activities, such as providing testimonies from high profile experts, and so on.³¹⁸ An analogy could be two companies that compete in terms of deceptive advertising.³¹⁹ It is the best organized interests groups that are likely to spend most money on rent-seeking and to obtain biased decisions to their benefit. Thus, this theory is directly contrary to the efficiency hypothesis, which argues that the adversarial process is likely to facilitate efficient rules.

Some comments on bureaucracy influences

Often, legal decisions are not done by the political elected persons directly, but by public officials appointed by the politically elected persons. These public officials may be

³¹⁶ If a judge is elected, he might need campaign money, like politicians. This applies to state-level judges in the US, but not federal judges, which are the focus of this study.

³¹⁷ This includes several contributions by the economist and lawyer Gordon Tullock, inter alia, Tullock (1980).

³¹⁸ This will be discussed and analyzed in more detail in Chapter Five.

³¹⁹ See Parisi (2002) for the same analogy.

independent judges who cannot be instructed by the politicians after they are appointed. However, if these independent judges are dependent on the politicians for a career in the judiciary, this may give the politicians some control. US Supreme Court judges are appointed for life *inter alia* to avoid such influence. Bureaucrats on the other hand are employees and agents for their political superiors usually subject to the instructive powers of the politicians.³²⁰ Politicians must then use incentives schemes to encourage the bureaucrats to implement their interest group politics.

The employed public officials maximize their own utility subject to those incentive mechanisms provided by the politicians. After the appointment of independent judges, the possibility of using incentive mechanisms is limited *ex post*. Politicians can, to some extent, increase and reduce budgets. If the politicians do not like the decision of one particular judge, they may increase the number of judges to reduce the average number of cases that will be handled by this judge. One of the most important instruments for the politicians in controlling independent decision makers is the power to appoint decision makers with the desirable preferences.³²¹ Bureaucrats subject to the instruction powers of the political principals can, in principle, be instructed to do exactly as they are told as a condition for their salary. It is not so easy, though. Bureaucrats possess private information both when it comes to the consequences and costs of decisions. This is likely to leave some room for determining rules according to their own preferences, which may deviate from the preferences of their principals.³²² The larger the possibilities for the decision makers to make decisions independently from their superiors, the more rent-seeking activities are likely to be targeted directly towards these decision makers.

Efficiency and interest group influence in the US versus the EU

The organization of the competition law decision-making in the US and EU is characterized by some fundamental differences, as stated above. The decision-making in the public enforcement in the EU follows an inquisitorial procedure subject to a limited judicial review. The public enforcement is the main way that the EU competition law is enforced, although private enforcement is possible. In the US, on the contrary, the antitrust decision-making follows, as a main rule, an adversarial procedure. Besides, most of the enforcement is private.

³²⁰ Some bureaucrats may be subject to limited instructive powers. This usually applies to heads of competition authorities and other regulatory bodies to secure the professional legitimacy of these bodies.

³²¹ Posner (2011) p. 726 f.

³²² There is much literature in the field of public choice on what bureaucrats maximize. Seminal contributions are Tullock (1965), Downs (1967) and Niskanen (1971). See also Mueller (2003) p. 359 f.

According to the efficiency hypothesis, the US system should facilitate rational rules, while this would not be obvious in the EU inquisitorial system, at least in the short run. The reason is that the rules in the US are determined by the courts in an adversarial procedure with a basis in the general antitrust standards. By the evolutionary mechanisms advocated by the followers of the efficiency hypothesis, the antitrust rules should become more and more efficient, and thus rational.

According to the interest group theory, the implications are more ambiguous. Since the European Commission is headed by commissioners that can be best described as politicians³²³, one should believe that the European competition law decision-making is more influenced by interest groups than the courts in the US. Furthermore, since the enforcement is executed with the aid of bureaucrats, some of the bureaucrats' pursuit of their own utility maximizing behavior is likely to be reflected in the enforcement and the determination of rules. It is likely that enforcement officials are rewarded more for what they do than what they do not do. Thus, enforcement officials may have an over-optimal preference for avoiding type-2 errors.³²⁴ Furthermore, government officials who want to reduce their amount of effort in finding violations may decide upon rules that have over-optimal harsh presumptions switching the burden of proof to the defendants. The result is over-inclusive rules and inefficiencies in evidence assessment.

The superiority of the adversarial process to the inquisitorial process is disputed by other contributors in law economics as described above. According to this theory, the enforcement of the European Commission is superior as they are likely to pursue the goal of finding the truth in a cost efficient way, while parties and interest groups that support the parties are more likely to dig in their deep pockets to obtain a desirable result in the adversarial procedure.

It would be difficult to conclude which theory of rent-seeking fits best to antitrust decision making. However, the risk of rent-seeking and some biases from rent-seeking are likely in both the EU inquisitorial system and in the US adversarial system. It will be shed more light on this topic in Chapter Five.

³²³ They have not been directly elected by the voters of the European Union, but are appointed by the political leadership in their home countries. Their loyalty should be with the EU as such. Thus, they are not under directly instruction by the politicians in their home country. However, since the commissioners are often career politicians, they are considered as politicians.

³²⁴ Posner (2011) p. 858.

4.4.3 Determination of rules and social choice

Often, antitrust decisions are not made by one decision maker, but by multiple decision makers that have to agree somehow. In the EU, the full commission of all the commissioners is the formal decision body who decide by majority voting. The judicial review is done in a forum by multiple judges. In the US, the appeal courts have multiple judges.

Collective decision making is analyzed in the theory of social choice.³²⁵ Kenneth Arrow was awarded the Nobel Prize in economics in 1971 for, inter alia, Arrow (1951) which derived the impossibility theorem of social choice.³²⁶ Simplified, Arrow (1951) showed that it is impossible to construct a utility function based on, inter alia, majority voting, which generally satisfies the assumptions of rationality. This theorem has been applied in the law and economics theory to study collective decision making by judges.³²⁷

As a result of the impossibility theorem, the collective nature of antitrust decision making may impose a threat to the possibility of achieving rational antitrust rules. One way out of this problem is if all decision makers share the same preferences. This may be true if all judges use an objective rationality standard in their determination of the rules. Such a standard was presented in Chapter Three. In practice, however, the various decision makers are likely to have different preferences that influence their decisions. Thus, the collective decision making nature of antitrust decision making is likely to impose a further challenge to achieve rationality in the determination of rules.

A difference between the US and EU decision making systems is the possibility of dissenting opinions. In the EU, neither the European Commission nor the courts provide dissenting opinions. This stands on the contrary to the US, where the judges may dissent. The possibility of dissention may increase the possibility of rationality in the determination of rules as one is not so dependent on finding some solution that survives majority voting or other methods to reach consent.³²⁸ The impact of multi-party decision making on antitrust decisions will be scrutinized further in Chapter Five.

4.5 Conclusions

The chief research questions addressed in the beginning of this chapter were: *Are the current antitrust rules likely to be rational? Are we likely to observe an evolution towards rational*

³²⁵ See Binmore (2008) for a short introduction.

³²⁶ Further developed by another winner of the Nobel memorial prize in economics Amartya Sen, see Sen (1970, 1995, and 1999).

³²⁷ See for instance Easterbrook (1982, 1984b) and Kornhauser (1992a, 1992b). See Rubin (2000) for a review of the literature.

³²⁸ For a law and economics based analysis of dissents, see Epstein et al. (2011).

rules? What can be done to promote more rational rules? The two first questions are discussed in turn below. Recommendations for promoting more rational rules are integrated into this discussion. The recommendations are summarized in the end.

Are the current antitrust rules likely to be rational?

In the discussion of rationality in the determination of antitrust rules it was analyzed how to choose rationally between rules and standards how to choose rationally the precision level of rules. It was found that the assessment principle in both the US and EU seems to have converged on presumption rules, which in practice mean that all conduct is assessed according to a standard. Presumption rules generate some of the benefits of rules, though, by mitigating the need to perform a full analysis in each case. A question then becomes how precise these presumption rules should be.

The confidence in the anticompetitive effects is used to determine the presumption rules in both the US and EU. The more confidence in the anticompetitive effects in question, the less is the need for inquiry into the actual circumstances of the case. In other words, the higher the a priori probability of anticompetitive effects, the less is the need for case specific evidence to confirm this a priori assessment. At a superior level, expected error costs, costs of formulation, and costs of application should all be taken into account in determining the rules. This requires a broader assessment than just assessing the likely anticompetitive effects of the conduct in question. Thus, on the question as to what can be done to promote more rational rules, it is desirable that the antitrust decision makers take more criteria into account when they determine the rules. In particular, if more factors relevant for choosing between rules and standards, such as the consequences of errors and the formulation and application costs were taken into account, this might have shown that clear rules not subject to rebuttal might be rational in some circumstances. Furthermore, the theory on optimal precision level of rules suggest that there is some rational precision level of rules where the gain of more precise decisions is outweighed by costs of complexity. This tradeoff seems not to be stated as a criterion in the determination of the precision level of the presumption rules neither in the US nor the EU.

Thus, it cannot be concluded that the presumption rules used in the EU and US are likely to be rational. The criteria used to determine these rules seem to be too narrow. A potential evidence of such irrationality might be the divergence of certain presumption rules used in the US and EU. The argument would be that, if the US and EU use different rules, they cannot all be rational at the same time. This would be a too hasty a conclusion, though.

The procedural frameworks in the US and EU are different, and the different benefits and costs of various rules may not be equal in the two systems. Still, since the confidence of the anticompetitive effects is the most influential criterion in the determination of the presumption rules in both systems, it is peculiar that the presumption rules are as different as they are. The differences are likely to be explained by other circumstances such as the organization of the decision process and the incentives, which will be commented upon below.

Are we likely to observe an evolution towards rational rules?

On the question as to whether we are likely to observe an evolution towards rational antitrust rules, two aspects relevant for such evolution were discussed.

The first aspect was whether the principle of precedence is an obstacle to the evolution of rational antitrust rules. One potential obstacle associated with the principle of precedence is path-dependence. The principle of precedence seems to facilitate a selection of cases that reinforce strong precedence-based rules while failing to phase out weak precedents. To avoid this, there should be mechanisms providing litigators with incentives to challenge weak precedence-based rules. It was shown above that, in the US, the private stakes resulting from the benefits of some irrational precedence-based rule may almost paradoxically contribute to the abandoning of such a rule. If, for instance, a precedence-based rule is likely to be weak due to new understanding and knowledge, the private interest associated with such a rule may provide the courts with cases that give the courts a chance to abandon that rule. If, for instance, some private party has an interest in litigating for the private benefits associated with a per se prohibition of minimum resale price maintenance, this gives the court the chance to abandon such a rule if it is not justified anymore due to new economic understanding. This is one of the benefits following from the important role of private enforcement in the US. If there was no such private enforcement, the courts in the US may not have got the chance to abandon the per se prohibition of minimum resale price maintenance as they did in *Leegin*.³²⁹

In EU competition law, which relies more heavily on public enforcement, the correction of undesirable precedence-based rules is less likely. If the European Commission does not see the merits of enforcing a rule, the precedence will be there until it becomes so old that this, as such, is enough for the rule to be considered abandoned. To avoid undesirable path-dependence, there should be some correction mechanisms. Private enforcement is one

³²⁹ *Leegin Creative Leather Prods, Inc. v. PSKS, Inc.*, 551 US 877 (2007).

such mechanism. The enforcement authorities may also, on principled grounds, challenge rules likely to be abandoned in courts, to check if courts actually are ready to abandon the rules. Thus, a recommendation that applies to the European Commission in particular is to challenge precedence-based rules likely to be abandoned by the courts, so they actually can be abandoned. Another recommendation is to continue the work on facilitating private enforcement in EU. Then private interests can be exploited to have all the rules challenged in the courts, not only those the European Commission choose to enforce.

Analogical reasoning is used to complement the principle of precedence as no cases are identical. Analogical reasoning constitutes a possible obstacle to the evolution of rational antitrust rules. Using analogical reasoning and not properly take into account the relevant circumstances may yield rules that are not rational. An antitrust rule derived by analogy from another antitrust rule should always be checked against the underlying antitrust standard and purpose to check if the analogy-based rule actually has merits in that respect. Thus, analogies can serve as a start in deriving a rule, but not as an end. It was shown above that a problem of using analogies might arise particularly if the analogy is based on a rule where the purpose is unclear. If the purpose of some antitrust rule is ambiguous, then how can we know if an analogy derived from the same rule is rational? By analogical reasoning a non-merit rule can expand to cover more and more practices and hereby creating more and more harm. The risk associated with such expansion is likely to be higher in the EU than in US as the amount of rules not serving any clear purpose can be argued to be higher in the EU. This does not mean that the risk is not present in the US too, though. Thus, the recommendation would be for antitrust decision makers to be careful in the application of analogical reasoning and in accepting analogy-based arguments presented by the parties. As just stated, analogy should be the start and not the end in determining an antitrust rule. This means that antitrust decision makers should always complement analogical reasoning with the underlying antitrust standard. Furthermore, analogies should not be derived from rules that themselves have no merits according to the antitrust standard.

A final point that was addressed related to the principle of precedence was the point that precedence-based rules can more or less intentionally contribute to the circumvention of the standard of proof. As more and more practices are considered or presumed anticompetitive as a matter of rule, it is a risk that the uncertainty associated with the anticompetitive effects is not properly addressed when the rule is applied. By this argument, the antitrust rules can expand into condemning practices not very likely to be anticompetitive.

Antitrust decision makers should be careful in deciding a case on the basis of presumption rules without properly taking the uncertainty associated with the presumptions into account. The rational use of presumptions in will be returned to in Chapter Five.

The second aspect analyzed was the impact of institutional factors and the incentives of the decision makers on the evolution of rules. It was found that interest group influence and utility maximizing behavior of the decision makers are likely to bias the evolution of rules away from rationality. The decision-makers will maximize their own net utility subject to the incentives provided them by their principals and the system. According to the efficiency hypothesis, the adversarial system with independent courts facilitates efficient rules. Some theories even predict that this evolution of efficient rules in the adversarial system is robust to biased preferences of the judges. The interest group theory predicts that political supervised inquisitorial enforcement authorities are likely to be influenced and biased by interest group influence in their determination of rules. In addition to this the decisions are likely to be biased by the preferences of the utility-maximizing bureaucrats. Thus, according to these theories, we should expect more rational rules in the US, which operates with an adversarial system, while the rules in EU should be biased both due to interest group influence and bureaucratic behavior. However, other theories predict a superiority of the inquisitorial system relative to the adversarial system in facilitating efficient rules. The argument is that the inquisitorial decision makers are likely to pursue the truth in a cost efficient way in the decision making, while rent-seekers have the opportunity to spend almost unlimited resources on deceptive argumentation in an adversarial court.

It was not concluded as to which of these theories that are most likely to be most informative. Rent-seeking and decision maker incentives are likely to disturb the evolution of rational rules in both the inquisitorial and adversarial system.

What can be done to promote more rational rules?

The antitrust decision makers should take more criteria into account when they determine the rules. The presumption rules in both the US and EU are determined by the confidence in the anticompetitive effects of the conduct in question. At a superior level, expected error costs, costs of formulation and costs of application should all be taken into account. This requires a broader assessment than just assessing the likely anticompetitive effects of the conduct in question.

To cope with the problems associated with the principle of precedence, a system should contain incentives for parties and enforcement authorities to try out precedence rules that are

likely to be overturned by the courts, so that they actually can be overturned. A system of private enforcement facilitates this. Thus, the work to promote private enforcement of EU competition law should continue. Enforcement authorities such as the European Commission may also enforce these rules to give the rules a chance to be challenged in the courts.

The principle of precedence is supported by analogical reasoning. Decision makers should be careful in applying analogies as an end in legal interpretation. Analogies can be used as a source of inspiration for what a rule should be, but this suggested rule should be checked against the underlying antitrust standard and purpose. Thus, analogies should be used very carefully when they are based on rules with an ambiguous purpose.

A risk of circumvention of the standard of proof is associated with the principle of precedence. To avoid the principle of precedence being used to circumvent the standard of proof, a responsibility rest on antitrust decision makers to not turn facts from previous cases into precedence-based rules without due critical considerations. The probative force of the presumption rule as such should be taken properly into account in the question of whether the presumption rule is rebutted.

It is more difficult to provide good suggestions to avoid biases as a result from interest group influence and personal preferences of the antitrust decision makers. However, a crucial element of avoiding such biases is to promote rationality in evidence assessment, which will prevent the evolution of precedence based on epistemologically wrong decisions. This topic will be returned to in Chapter Five.

5 Rationality in the assessment of antitrust evidence

5.1 Introduction and motivation

In this chapter more precise directions for rationality in the assessment of antitrust evidence, including rational gathering of evidence, are provided. The rational assessment of antitrust evidence will be compared to the assessment principles and procedures used in the actual assessment of antitrust evidence.

The chapter begins by presenting a decision theoretic framework for rational evidence assessment. This framework will be an extension of the framework presented in Chapter Three. The framework for rational evidence assessment will be followed by a study of how antitrust evidence is actually assessed and how this actual evidence assessment coincides with rational evidence assessment. To inform the performance of actual evidence assessment further an economic model of actual evidence assessment is presented. Suggestions to improve the rationality in antitrust evidence assessment will be presented throughout the discussion. The results will be summarized in a concluding section.

The chief research questions addressed in this chapter are: *How should antitrust evidence rationally be assessed? Do the assessment principles and procedures in antitrust analysis promote rational evidence assessments? How can the assessment principles and procedures used in antitrust analysis be improved to promote rational evidence assessments?*

5.2 Rational evidence assessment

5.2.1 The superior principle

Beckner and Salop (1999) stated that “*The court first should gather information that is least expensive, resolves the most uncertainty, and is most likely to affect its decision.*” This is a good overall description of what rational assessment of legal evidence is. In this subchapter, the decision theoretic framework established in Chapter Three is used to derive more precise and operational implications as to what rational evidence assessment is. The analysis will be related to antitrust, but the discussion of actual antitrust evidence assessment will be returned to in a separate subchapter.

5.2.2 A decision theoretic framework for rational evidence assessment

Evidence and expected loss minimization

A rational decision is the decision that maximizes expected utility, which is the same as minimizing expected loss.³³⁰ It is rational to decide violation if the expected loss of wrongfully deciding violation is less than the expected loss of wrongfully deciding not violation.³³¹ Let L_V be the loss of wrongfully deciding violation (type-1 error). L_{NV} is the loss of wrongfully deciding not violation (type-2 error). p_V is the probability that the law was actually violated, and $p_{NV}=1-p_V$ is the probability that the law was not violated. The expected loss of finding violation is then $EL_V=(1-p_V)L_V$. This is the expected loss from type-1 error. The expected loss of not finding violation is $EL_{NV}=p_V L_{NV}$. This is the expected loss from type-2 error. The rational decision is to decide violation if $EL_V < EL_{NV}$ and not violation otherwise.³³² This means that it is rational to decide violation if $(1-p_V)L_V < p_V L_{NV}$. The expected loss is then $EL = \min[EL_V, EL_{NV}] = \min[(1-p_V)L_V, p_V L_{NV}]$. The precise content of these losses was discussed in Chapter Three.

Now evidence can be introduced into this picture. We can think of assessing evidence as hypothesis testing. Let H_V be the hypothesis that the law is violated. This means that the probability of violation can be written as $p_V = p(H_V \text{ is true}) = p(H_V)$. The probability that the law is not violated can be written as $p_{NV} = p(H_V \text{ is false}) = p(H_{NV})$. Since $p_{NV} = 1 - p_V$, we have $p_{NV} = 1 - p(H_V)$.

Let \bar{E}^{Tot} be the total amount of potential evidence that can be gathered. Let \bar{E} be the evidence that is gathered, and let e be the evidence actually observed. This means that e is the outcome of \bar{E} . When we gather evidence, we can choose both what evidence to gather and in what sequence to gather the evidence. If e is relevant evidence, it affects the probability assessment of H_V . $p(H_V|e)$ is the probability we assign to H_V given evidence e . In an antitrust context, e might, for instance, be some e-mail from company A to company B on planned price changes, and H_V the hypothesis that it has been an illegal agreement on price.

³³⁰ This can be derived from the axioms of rational behavior. An intuitive explanation is that this is the decision rule that minimizes losses in the long run.

³³¹ As explained in Chapter Three, two extreme decisions are assumed: violation and not violation. This is a simplification. Both violation and not violation might consist of many decisions. Violation can constitute a continuous space of decisions. If deciding violation involves fines or other sanctions, every possible size of the fine or sanction is a separate decision. When it comes to deciding not violation, this might also involve many decisions. This can involve an acquittal, which just means that a violation is not found according to the standard of proof. However, the decision maker can also, in some circumstances, state explicitly that the conduct in question is not a violation. The binary decision framework is chosen for simplicity. This will, most of the time, be illustrative for the study of rationality. If this framework is deviated, this will follow clearly from the text.

³³² More precisely, it is rational to decide violation if and only if $EL_V \leq EL_{NV}$. However, we assume that if the expected loss of deciding violation and not violation is equal, then not violation will be decided.

We do not know the outcome of the evidence-gathering before it is gathered. If, for instance, e is written communication of prices, we can search for this evidence. If we find this evidence, it might boost our probability assessment of H_V . Not finding the evidence might also have some impact on our probability assessment of H_V , but not so much as if we found the evidence of written communication. In line with rational decision theory, we assume that we know the a priori probability of finding such evidence if we search for it. This means that we know the probability distribution for $p(\bar{E})$ for all possible subsets of \bar{E}^{Tot} . For instance, even if we do not know if we will find communication if we search for it, we at least know the probability of finding such evidence.³³³ We also know how this evidence potentially affects our probability assessment of H_V . This means that, for a given outcome of evidence e , we can calculate $p(H_V|e)$.

For some given evidence e , it will be rational to find violation if $EL_V(e) < EL_{NV}(e)$. Given evidence e , we have that $EL_V(e) = (1 - p(H_V|e))L_V$ and $EL_{NV}(e) = p(H_V|e)L_{NV}$, which makes it rational to find violation if $(1 - p(H_V|e))L_V < p(H_V|e)L_{NV}$. The expected loss of a rational decision given evidence, e , is then

$$EL(e) = \min[EL_V(e), EL_{NV}(e)] = \min[(1 - p(H_V|e))L_V, p(H_V|e)L_{NV}].$$

Evidence, expected loss minimization, and costs of gathering evidence

Gathering evidence, \bar{E} , is also associated with costs. It is assumed here that the cost of gathering evidence is $c(\bar{E})$, and that this cost is known a priori.³³⁴ This cost function will be elaborated upon below.

A rational decision that includes evidence gathering minimizes the sum of all costs. This is the sum of the expected losses from errors and the costs of gathering evidence. The minimization of the sum of the expected loss from error and costs of gathering evidence can then be written as:

$$\text{Min}_{\bar{E}} E_{\bar{E}}(EL(\bar{E}) + c(\bar{E})).$$

Since $EL(\bar{E})$ is equal to $\min[1 - p(H_V|\bar{E})L_V, p(H_V|\bar{E})L_{NV}]$, this becomes

³³³ This assumption and ways around this assumption will be discussed in the subchapter of probative force below.

³³⁴ In theory, we could assume that there was some uncertainty associated with the costs, and then operate with expected values. This is a complication is not pursued in this study.

$$\text{Min}_{\bar{E}} E_{\bar{E}}(\min[(1-p(H_V|\bar{E}))L_V, p(H_V|\bar{E})L_{NV}] + c(\bar{E})).$$

The idea behind this formula is simple although it might appear complicated. There are two minimization operations. Given that some evidence, e , is gathered, the rational decision maker will minimize expected loss. But before the evidence is gathered, he has to “average” over all possible outcome of \bar{E} by taking the expectation when he is deciding to gather the evidence or not. This is the $E_{\bar{E}}$ part. The $\text{Min}_{\bar{E}}$ refers to that the decision maker must optimize the evidence gathering taking the cost of evidence-gathering into account. The evidence gathering must be optimized both with regard to the amount of evidence and the sequence in which the evidence is gathered. This will be illustrated by an example later in this subchapter.

A rational decision maker will gather evidence based on how it will reduce the expected loss of the decision by resolving uncertainty and on the cost of gathering the evidence as such. As pointed out in the law and economics literature, the reduced expected loss from error from gathering evidence must be weighed against the cost of gathering evidence.³³⁵ A question is if it always reduces the expected loss of error to gather more evidence. Let us say that we possess some compelling evidence for a violation. Wouldn't then gathering some possible contradictory evidence reduce the probability of H_V and then increase the expected loss of the decision? The answer to this is, no. The existence of such evidence must, never-the-less, be taken into account a priori. Let us say that there is a 90 percent chance that such contradictory evidence exists. Then this uncertainty must be taken into account a priori. It can be shown that, a priori, gathering free evidence will always reduce the expected loss of a decision.³³⁶ Recall that there is also a chance that the probability of H_V will increase if the 10 percent chance that the evidence gathering reveals that such evidence does not exist kicks in. Then the expected losses will be correspondingly lower. Since the uncertainty must be taken into account a priori, the expected loss of errors will always decrease if we get more evidence. Thus, it will always reduce expected loss of errors to include free evidence in the decision.

However, evidence is not free. It will then be a tradeoff whether gathering the evidence pays off. If EL is the expected loss without gathering evidence, \bar{E} , and $EL(\bar{E})$ is the expected loss when \bar{E} is gathered, the decision value of the evidence, \bar{E} , can then be measured

³³⁵ See Posner (1999), Posner (2011) p. 819 f. and Spier (2007). A very simple model would be to just assume that $E(e)$ is the reduced expected error losses from gathering evidence and that $C(e)$ is the cost of gathering evidence. E is decreasing in e and C is increasing in e . The optimal amount of evidence is when $E'(e)=C'(e)$. See Posner (2011) p. 819.

³³⁶ See Raiffa and Schlaifer (1961). This will be illustrated by an example below.

as $EL-EL(\bar{E})$.³³⁷ The question is if this decision value exceeds the cost of gathering evidence. Dynamic programming can, in principle, be used to solve the optimization problem in gathering evidence³³⁸, but in practice we have to rely on heuristics. This optimization problem is returned to below in the discussion of optimal evidence gathering.

Everything else equal, the evidence that resolves most uncertainty should be gathered first. This is the evidence with the highest decision value. The decision value of evidence will be discussed in detail below. The evidence's decision value is, inter alia, dependent on its probative force. Rationally assessing probative force will be discussed in more detail below. The maximal probative force of evidence is evidence that resolves the factual issue with certainty. This is evidence that is only compatible with either the law having been violated or not. This is sometimes described as direct evidence.³³⁹

Furthermore, everything else equal, the evidence associated with the lowest cost of gathering should be gathered first. This also includes that the one who can gather a piece of evidence to the lowest cost should have the burden to do so. This can be solved with optimal presumptions and evidence competition between two conflicting parties.

It is a tradeoff between decision value and costs. The cheapest evidence with the highest decision value should normally be gathered first. The tradeoff between decision value and costs is the overarching topic in the rest of this subchapter.

Evidence, expected loss minimization, and standard of proof

In the decision theoretic framework above, the standard of proof was assumed endogenous. Finding violation is rational if $(1-p(H_V|e))L_V < p(H_V|e)L_{NV}$, which is the same as

$$p(H_V|e)/(1-p(H_V|e)) > L_V/L_{NV}.$$

This means that the higher the relative loss of wrongfully deciding violation is compared to wrongfully deciding not violation, the higher a probability for violation is necessary for violation to be the rational decision. This means the higher the relative loss from type-1 error to type-2 error, the more confident we must be that there was a violation for it to be a rational decision to decide violation.

³³⁷ See Parmigani and Inoue (2009) p. 259 f.

³³⁸ See Berger (1985) p. 432 f. Parmigani and Inoue (2009) p 221 f. for a general framework on how this maximization problem can be solved. Beckner and Salop (1999, Kerber et al. (2008), and Kretschmer (2011b) use this approach in the antitrust context. This literature will be returned to below.

³³⁹ Walton (2002) p. 74 refers to this as the McCormick-criterion after Charles T. McCormick (1889-1963). This is roughly the definition of direct evidence used by Anderson et al. (2005) p. 76.

In the legal context, the decision maker is often not allowed to adjust the standard of proof to the specific relative losses of type-1 and type-2 errors in the case. In pure civil cases, balance of probabilities is the main rule. In a decision theoretic framework, this means that type-1 errors and type-2 are considered equally bad. In criminal procedure, however, the main rule is that criminal liability must be proven beyond reasonable doubt. Decision theoretically this means that type-1 errors are considered far worse than type-2 errors. Thus, the loss of finding an innocent wrongfully to be guilty is considered much larger than the loss of finding a guilty wrongfully to be innocent. This can partly be explained by the high sanctions including imprisonment, which are available in criminal cases. In civil cases where the government imposes some administrative sanctions of punitive character, the standard of proof is not as settled as in criminal procedure, and there might be room for more flexibility to weigh loss of type-1 errors against losses of type-2 errors. In antitrust, it might, for instance, in some cases be a substantial risk that some substantial innovation is not realized as a result of a type-1 error, while in other cases this risk might be associated with type-2 errors. A more detailed description of the actual standard of proof in antitrust was given in Chapter Two.

The question of whether a fixed standard of proof is rational or if it should be flexible to the circumstances of the specific case, is partially a question of costs. It will impose costs on judges and courts to assess the consequences of errors in specific cases. A fixed standard of proof saves this cost. A fixed standard of proof also promote legal certainty, as it is easier to assess the legal consequences of actions. Still, judges and other antitrust decision makers may consciously or unconsciously take into account the loss of errors.³⁴⁰ If a decision maker de facto uses another standard of proof than formally stated, it might appear confusing. If, for instance, a decision maker applies a higher standard of proof than balance of probabilities in a pure civil case from an error loss perspective, but still argues that balance of probabilities was applied, this would be confusing for anyone who wants to learn how decision makers assess evidence.

The conditions for a rational decision can be derived under the constraint that the standard of proof is fixed. Assume that the standard of proof for finding violation is α (for instance, 0.99). This means that violation is found if $p(H_V|e) > \alpha$ and not else. The expected a priori loss of a rational decision, including gathering evidence, can then be written as:

$$\text{Min}_{\bar{E}} E_{\bar{E}}((1-p(H_V|\bar{E}))L_V I(p(H_V|\bar{E}) > \alpha) + p(H_V|\bar{E})L_{NV} I(p(H_V|\bar{E}) \leq \alpha) + c(\bar{E})),$$

³⁴⁰ The incentives of judges and other antitrust decision makers will be discussed in more detail below.

where

$$I(p(H_V|\bar{E}) > \alpha) = 1 \text{ if } p(H_V|\bar{E}) > \alpha \text{ and } 0 \text{ else,}$$

and

$$I(p(H_V|\bar{E}) \leq \alpha) = 1 \text{ if } p(H_V|\bar{E}) \leq \alpha \text{ and } 0 \text{ else.}$$

With a fixed standard of proof, the decision maker may sometimes be forced to make a suboptimal decision. This can be partially mitigated by collecting more evidence, but might also not make it worthwhile to gather as much evidence as is optimal. This will be illustrated in the example below.

The framework exemplified

An example of evidence assessment in the rational decision framework presented above might clarify its nature. Assume that in an antitrust case two companies are under scrutiny for price fixing. Let us say that the current evidence is extensive data on parallel pricing behavior. However, ex ante, parallel pricing is both consistent with tough competition and a price conspiracy. Assume that in most situations parallel pricing is a result of tough competition. Thus, based on this knowledge, we assume that $p(H_V) = 0.09$ while $p(H_{NV}) = 0.91$. Assume that the cost of wrongfully finding a price conspiracy is \$20M, and the cost of wrongfully acquitting a price conspiracy is \$10M.

Assume the only other evidence that can be found is if there was communication between the firms before every price change. Thus, we can gather \bar{E} , which can have the outcomes e or not e , where e is that such communication is found while not e is that such communication is not found. If such communication exists, then $p(H_V|e) = 0.8$, while $p(H_{NV}|e) = 0.2$. The probability that such evidence, e , can be found is 10 percent. This means that $p(e) = 0.1$. If \bar{E} is gathered but communication cannot be found, then $p(H_V|\text{not } e) = 0.01$ while $p(H_{NV}|\text{not } e) = 0.99$.³⁴¹

³⁴¹ The consistency of these numbers can be justified by the theory presented in the section on probative force below. Numbers in the example have been rounded to two decimals as information to those who want to check the consistency of the numbers.

Before gathering evidence, the rational decision would be to decide not violation. This would give an expected loss of \$0.9M ($0.09 \times \$10M$). If we gather evidence and e is present, it would be rational to decide violation. It would give us an expected loss \$4M ($0.2 \times \$20M$). If e cannot be found, then it would be rational to decide not violation with expected loss of \$0.1M ($0.01 \times \$10M$). The expected loss if we decide to gather the evidence, but before we know the outcome of the gathering, will be $0.1 \times \$4M + 0.9 \times \$0.1M = \$0.49M$. Thus, gathering evidence will expectedly reduce our expected loss by \$0.41M ($\$0.9M - \$0.49M$). Thus, as long as it cost less than \$ 0.41M to gather and assess the evidence, we should do it.

With a fixed standard of proof, the situation will change. Let us say that the standard of proof in proving violation is 0.99. As $p(H_V|e) = 0.8$ is the maximal confidence we can obtain that there has been a violation, the only available decision is to decide not violation. If we still choose to gather the evidence the expected loss of the decision after gathering evidence will be $0.1 \times 0.8 \times \$10M + 0.9 \times 0.01 \times \$10M = \$0.9M$. Thus, there is nothing to gain by gathering evidence.

Now, for the sake of analysis, let us assume that parallel behavior gives a strong presumption of violation. Let us say that violation will be found unless it will be proved that the probability of violation is equal to or less than 0.1 percent. The expected loss if evidence is not gathered in this situation is \$18.2M as there is a 0.91 chance of an error loss of \$20M. If evidence is gathered for and e is found, the expected loss will be \$4M ($0.2 \times \$20M$). If evidence gathered for and not found, this will suffice to decide not violation. The expected loss will then be \$0.1M ($0.01 \times \$10M$). The a priori expected loss when gathering evidence will then be $0.1 \times \$4M + 0.9 \times \$0.1M = \$0.49M$. Thus, gathering evidence will reduce our expected loss by \$17.71M ($\$18.2M - \$0.49M$). As long as it costs less than \$17.71M to gather evidence, it should be gathered. Thus, when the standard of proof is flexible, it is only rational to gather evidence as long as it costs less than \$0.41M. If the cost is between \$0.41M and \$17.71M, it will be rational to gather evidence with a fixed standard of proof and a strong presumption for violation, but not with a flexible standard of proof. This is an example of how a fixed standard of proof may make it rational to gather more evidence than with a flexible standard of proof.

5.2.3 Rationally assessing the probative force of evidence

Evidence, uncertainty, and probative force

It appears from the decision framework for rational evidence assessment described above that it is imperative to find the probability of violation given evidence. More precisely we need to know $p(H_V|e)$ for any possible e . Thus, we need to know to what extent evidence impact the probability of a hypothesis. Probative force of evidence is about how much some evidence affects the probability of a hypothesis we want to test. Evidence reduces uncertainty. In legal terms, one can say that the rational weight of evidence is determined by its probative force. Evidence with strong probative force should be given high weight.³⁴²

In the extreme case, some evidence can resolve all uncertainty. If one can deduce from evidence that one specific hypothesis is true, the hypothesis is true as long as the premises for the deduction are true. If a piece of evidence is only consistent with one hypothesis, the hypothesis can be accepted with certainty, and if evidence is deductively inconsistent with one hypothesis, this hypothesis can be rejected with certainty.³⁴³ Evidence that is only consistent with either that a law is violated or that a law is not violated is sometimes referred to as direct evidence.³⁴⁴ Direct evidence resolves the issue; there is no more information in knowing the truth than knowing the evidence. The role of deduction in evidence assessment has a central role in detective novels like Sherlock Holmes, where the detective, by deduction, eliminates hypothesis after hypothesis and in the end is left with the one true hypothesis.

Normally, deduction from evidence to the truth of a legal hypothesis on the violation of law is not possible. In real life, we usually do not have the evidence to resolve the issue with certainty. Even if some evidence, at its face, resolves the uncertainty, for instance, some participating witness testifying that a price conspiracy was concluded in a business meeting, credibility issues reduce the “concluding” force of this evidence to a question of probative force. The witness may lie for some reason. Non-deductive inference means that it is not possible to infer the truth of one hypothesis from the evidence with certainty. Evidence makes hypotheses more or less probable. A piece of evidence is relevant and has probative force if it makes a hypothesis more or less probable. Empirical experiences and structural knowledge on probable connections are used to evaluate how probable a hypothesis is given evidence. This

³⁴² See Schum (2009).

³⁴³ The premise for valid deduction is formal logic and the validity of the premises. Formal logic means, for instance, to use logical laws like if A implies B, then not B implies not A (modus tollens), or if A implies B and B implies C, then A implies C (using modus ponens in two steps).

³⁴⁴ Walton (2002) p. 74 refers to this as the McCormick-criterion after Charles T. McCormick (1889-1963). This is roughly the definition of direct evidence used by Anderson et al. (2005) p. 76.

involves inductive reasoning, which means to generalize from observations and examples back to some specific situation. Assume that we know that almost always when competing firms with more than 70 percent market share together merge, competition will be reduced and prices will increase. This can be used to say that is probable that a proposed merger between two companies holding more than 70 percent will reduce competition and increase prices. Inductive reasoning is subject to some logical problems addressed already by Hume (1748).³⁴⁵ Why does the fact that the sun has been rising every day so far make it probable that the sun will raise tomorrow? This is not the right place to elaborate on such philosophical issues. However, the problem of induction will be returned to, as it is central in the critique of the mainstream decision theory by the proponents of causal decision theory. Inductive inference can be considered as model-based inference. The question then is whether assuming that the sun will rise every morning is a good model to utilize in decision making.³⁴⁶ Model-based inference will be returned to in detail in Chapter Six.

Given the possibility to express the connection between evidence and hypotheses in probabilistic terms, probability calculus provides guidance on how to handle these probabilities. In fact, adherence to the rules of probability is one of the crucial assumptions for rationality, as explained in Chapter Three. If these rules are not followed, decisions will be incoherent. Rational decisions require beliefs to be updated according to the laws of probability if new information becomes available.³⁴⁷

Some legal scholars have has expressed obstacles when it comes to applying probability calculus to legal evidence, and these obstacles will be addressed properly later.³⁴⁸ However, for now we are concerned with rational decisions under uncertainty. Thus, probability calculus is used to assess the probative force of evidence. It should also be noted that exact numbers are not necessary for probability calculus to inform legal assessment of evidence. It is the principles and logic of probability calculus that is important to inform the rational assessment of probative force of evidence.

³⁴⁵ See for instance Gilboa (2009) p. 21.

³⁴⁶ I decide to not bring a flashlight when I go out in the morning because I rely on the sunrise.

³⁴⁷ As explained in Chapter Three, there have been developed theories for rational decisions with more lenient representations of uncertainty. These are promising theories for modeling rational legal decisions. However in this study, the mainstream theory of rational decisions, which is based on exact probability measures, is relied upon.

³⁴⁸ See, for instance, Stein (2011).

It will be described below how probability theory is used to determine the probative force of evidence.³⁴⁹ Examples from antitrust will be drawn upon. However, the actual assessment of antitrust evidence will be studied in a separate subchapter below. Thus, the principles presented here will serve as a benchmark for the study of the rationality of actual evidence assessment below. Note that the basic rules of probability calculus are based on the axioms in Kolmogorov (1950), which were described in Chapter Three. These rules of probability are applied without further justification here.

Numerical and relative probative force of evidence

Let H_V be the hypothesis of violation and let e be the evidence gathered. The probability of the hypothesis given the evidence is $p(H_V|e)$. By knowing e , the probability of H_V changes from $p(H_V)$ to $p(H_V|e)$. A measure on the probative force of evidence is $p(H_V|e) - p(H_V)$. This measures in numerical terms how much the probability of the hypothesis change by knowing the evidence e . If this measure is positive, the evidence supports H_V by increasing its probability and if it is negative the evidence contradicts H_V by reducing its probability.

Another way to measure probative force of e is to look at how much it relatively changes the probability of H_V . This means that we look at the ratio $p(H_V|e)/p(H_V)$. If this measure is larger than one, the evidence supports H_V , and if it is less than one, the evidence contradicts H_V .

For both the numerical measure and the ratio measure on probative force the question is if $p(H_V|e)$ is larger, equal to, or less than $p(H_V)$. Some evidence, e , can be said to have positive relevance if $p(H_V|e) > p(H_V)$ and negative relevance if $p(H_V|e) < p(H_V)$.³⁵⁰ Recall that this definition coincides with how the term relevance used in Federal Rules of Evidence (FRE), Rule 401, where relevance is a term used for evidence that makes a hypothesis more probable or less probable. Another way to say this is that e confirms H if (and only if) $p(H_V|e) > p(H_V)$, and disconfirms H_V if (and only if) $p(H_V|e) < p(H_V)$.³⁵¹ Note that, by definition,

³⁴⁹ Only the highlights of probability calculus will be presented here. For those who want to explore the foundations of probability calculus in more depth there is a large body of literature. Books on statistics such as Wasserman (2003) give an introduction to probability and the variety of statistical methods. Books on probability theory, decision theory, and more generally, the philosophy of science provide fundamental understanding on the philosophy of probability concepts. Achinstein (2001), Hacking (2001) and Sober (2008) Chapter 1, provide a philosophy of science perspective. Parmigiani and Inoue (2009), Gilboa (2009), and Binmore (2009) provide a decision theoretic perspective on probability. Farnsworth (2007) Chapter 29 and 30, and Dawid (2005) introduce probability in the context of legal assessment of evidence. Taroni et al. (2010) use is a comprehensive study of the use of probability theory and decision theory in forensic science. Sanchirico (2012) discuss probabilities in an evidence law and economics perspective.

³⁵⁰ Achinstein (2001) p. 45 uses this definition and traces this back to Carnap (1962).

³⁵¹ Sober (2008) p. 15.

H_V and e are independent if $p(H_V|e)=p(H_V)$. If e is independent of H_V , it is not relevant and has no probative force. The weather in Chicago is probably independent of the existence of a price conspiracy in New York, and is thus no evidence for such a conspiracy (although you never know).

A question is whether the numerical measure or the ratio measure is best to measure the probative force of evidence. Technically, this is irrelevant for the loss minimization framework presented above, but the two measures provide some different intuitive insight. Assume that $p(H_V)=0.001$ and $p(H_V|e)=0.002$. This means that the evidence, e , increases the probability of H_V with only 0.001, which is quite little in numerical terms. However, with the same numbers, the ratio $p(H_V|e)/p(H_V)$ is 2, which means that the evidence makes the hypothesis of violation twice as probable. This may be considered to be quite much.

Exploiting Bayes' rule

Sometimes, we have empirical data, experiences, and structural knowledge to assess $p(H_V|e)$ and $p(H_V)$ directly by induction. If we, for instance, scrutinize a company for abuse of dominance, and receive evidence that the company has less than 10 percent market share, we know that $p(H_V|e)$ is very small by direct induction from those experiences. So, if $p(H_V)$ was not very small from the beginning, this evidence has strong probative force.

When such direct induction is not possible, we can use probability calculus to say more about $p(H_V|e)$. The conditional probability of the hypothesis given the evidence is $p(H_V|e)=p(H_V \cap e)/p(e)$. By the definition of conditional probabilities, we know that $p(e|H_V)=p(H_V \cap e)/p(H_V)$, which means that $p(H_V \cap e)=p(e|H_V)p(H_V)$. Thus, by using the definition of conditional probability two times, we get

$$p(H_V|e)=p(H_V \cap e)/p(e)=p(e|H_V)p(H_V)/p(e).$$

This is the so-called Bayes' rule. The rule on conditional probability is used the other way, and $p(H_V \cap e)$ is replaced with $p(e|H_V)p(H_V)$. This transformation is very important in the application of probability calculus to evidence. We may have much better empirical data or structural knowledge to say something about the likelihood of some evidence given the truth of a hypothesis than the opposite. The formula says that the probability of a hypothesis given evidence is equal to the probability of the evidence given that the hypothesis is true,

multiplied with the a priori probability with the hypothesis and divided by the probability of the evidence in general. This means that the probability of an hypothesis given evidence is larger, the more often the evidence occur given the truth of the hypothesis, the more likely the hypothesis is a priori (before evidence is known), and the less probable the general occurrence of the evidence is.

Recall from above that $p(H_V|e)/p(H_V)$ is the ratio measure of probative force. Another way to see the formula derived just above is that $p(H_V|e)=[p(e|H_V)/p(e)]*p(H_V)$, which is the same as $p(H_V|e)/p(H_V)=p(e|H_V)/p(e)$. This means that the probative force for e in support of H_V in relative terms is stronger the more likely the evidence is given that the hypothesis is true relative to the probability of evidence in general. In intuitive terms this means the probative force is stronger the more likely it is that we find e if it we know that H_V is true than if we don't know whether H_V is true or not. However, how much $p(H_V|e)$ becomes in numerical terms is dependent on the a priori probability of the hypothesis $p(H_V)$. Even if $p(e|H)/p(e)$ is large, the resulting $p(H_V|e)$ will not be large in numerical terms if $p(H_V)$ was low in the first place. Thus, to know the probative force in numerical terms, which is $p(H_V|e)-p(H_V)$, we need to take the a priori probability into account. To not take this a priori probability into account is referred to as the base rate fallacy.³⁵² This will be returned to in the discussion of cognitive biases below.

By the laws of probability we have

$$p(e)=p(e\cap H_V)+p(e\cap H_{NV})=p(e|H_V)p(H_V)+p(e|H_{NV})p(H_{NV}).$$

Thus, the probability of e in general is nothing more than a weighted average of the occurrence of e , whether H_V is true or not, where the weights are the probability the hypothesis being true or not, respectively. By performing some simple algebra, we find that $p(e|H_V)>p(e)$ if and only if $p(e|H_V)>p(e|H_{NV})$.³⁵³ Thus, the evidence is more likely given the truth of the hypothesis than in general if and only if the evidence, e , is more likely to occur if we know that the hypothesis is true than if we know that the hypothesis is false. Thus, what is important for the relative probative force of evidence is the likelihood of evidence given that the hypothesis is true relative to the likelihood of the evidence given that the hypothesis is false. If parallel pricing is equally likely, price conspiracy or not, parallel pricing does not

³⁵² Also known as the prosecutor fallacy.

³⁵³ $p(e|H_V)>p(e)$ is the same as $p(e|H_V)>p(e|H_V)p(H_V)+p(e|H_{NV})p(H_{NV})$, which is the same as $p(e|H_V)(1-p(H_V))>p(e|H_{NV})p(H_{NV})$. Since $1-p(H_V)=p(H_{NV})$, then this is the same as $p(e|H_V)>p(e|H_{NV})$.

have probative force in favor of a price conspiracy. A fallacy is to deduce probative force from consistency with a hypothesis alone, for instance to deduce probative force from the fact that parallel pricing is consistent with a price conspiracy. This is not enough. This will be discussed in more detail in the discussion of actual evidence assessment below.³⁵⁴

The problem of priors

Recall from above that $p(H_V|e) = p(H_V \cap e)/p(e) = p(e|H_V)p(H_V)/p(e)$. Thus, to determine $p(H_V|e)$, the one who assess evidence must have some positive a priori belief on the probability of the hypothesis, $p(H_V)$, for instance, the general probability that some restraint is anticompetitive. The problem of the subjectivity of priors was described Chapter Three. Even if there are objective ways in assessing the consistency of evidence, which is to assess $p(e|H_V)$, the subjectivity of priors will constitute an obstacle to an objective assessment of probative force. Luckily, there are ways around this.

One solution is that the impact of priors will be less and less as more evidence is gathered.³⁵⁵ Thus, by gathering more and more evidence, the influence of the prior on the final probability assessment will be less and less.

Another solution to the problem of priors is to legally fix the priors to get some objective common priors. Both the EU and US operates with presumption rules that can be seen as a way to fix priors. These presumption rules were described in Chapter Four and will be returned to in the discussion of actual evidence assessment below. The presumption rules for antitrust violations are based on the general confidence in the anticompetitive effects of the type of the restraint in question. The less general confidence in the anticompetitive effect, the more evidence based on the actual circumstances must be assessed to establish a presumption of anticompetitive effects. This is in line with Bayes' rule. The general confidence in the anticompetitive effects can be seen as the a priori probability of anticompetitive effects $p(H_V)$. The lower this is, the more evidence of anticompetitive effects in terms of $p(e|H_V)/p(e)$ is necessary to establish a presumption rule determined by a high $p(H_V|e)$.

Another legally fixed prior relevant for antitrust analysis is the presumption of innocence. The presumption of innocence is an important legal safeguard in criminal

³⁵⁴ This can be an element of confirmation bias, where evidence with no probative force is interpreted to support a hypothesis in line with a person's prior beliefs.

³⁵⁵ See Wasserman (2003) p. 181 f. One cannot say in general that the impact of priors will be eliminated as more evidence is gathered; the impact of priors becomes less, though.

enforcement. A presumption of innocence may intuitively seem to require that the probability of a hypothesis of violation, $p(H_V)$, should be assumed to be zero before one starts to assess evidence. However, the equation for $p(H_V|e)$ given above has no meaning when assuming that $p(H_V)=0$ because we multiply by $p(H_V)$. With the theory of Bayesian updating, no evidence will ever make the probability of violation larger than zero if the a priori probability of violation is zero in the first place. Does that mean that a presumption of innocence precludes probability calculus as a tool to inform legal evidence assessment? Not necessarily! A presumption of innocence could be instrumentally fitted to the Bayesian framework by assuming that a person scrutinized for some violation, is, a priori, considered no more probable to have committed the violation than any other randomly chosen person in the population.³⁵⁶ Another way to safeguard the presumption of innocence is to only relate to the ratio measure of probative force and avoid the problem of a priori probabilities. Then, $p(e|H_V)/p(e)$ is a factor that the a priori probability of violation can be multiplied with to find the probability of violation given the evidence. This means that whatever belief we have in the probability of the hypothesis before the evidence is available, the probability of the hypothesis becomes $p(e|H_V)/p(e)$ larger by having the evidence.

A question that is interesting both from a legal perspective and a rationality perspective is the compatibility of the strong presumptions of anticompetitive effects established by the antitrust presumption rules and the presumption of innocence. Often, these presumptions are logically compatible. If, for instance, agreements on prices is subject to a strong presumption of anticompetitive effects and, thus, illegality, the question of whether there was an agreement on prices or not is subject to the presumption of innocence. However it is not difficult to imagine conflicts between presumptions of anticompetitive effects established by the antitrust presumption rules and the presumption of innocence. Would it, for instance, be sufficient to establish reasonable doubt on the existence of offsetting consumer gains to escape illegality? Probably not! Still, in this case, the underlying antitrust standard is not satisfied according to a reasonable doubt requirement. A solution to this legal issue will not be discussed here. From a rational decision perspective, the question is whether establishing reasonable doubt should be enough to switch the burden back to the plaintiff to eliminate that reasonable doubt by further evidence. Rational use of presumptions will be returned to in the section on minimizing costs of evidence gathering below.

³⁵⁶ It would be beyond the scope of this study to enter into a discussion on the precise legal content of the presumption of innocence. As a starting point, this presumption means that a charged person benefits from any reasonable doubt.

Probability ratios, likelihood ratios, and probative force

So far, we have only analyzed the probative force of some evidence associated with a single hypothesis of violation, H_V . Often, the assessment of evidence is performed in the context of many competing hypotheses. In this subsection it will be shown that the analysis of probative force of evidence might be simplified by explicitly taking into account the competing hypotheses. The probative force of evidence for a hypothesis relative to a competing hypothesis can be measured by how the evidence changes the probability ratio between the hypotheses. The probability ratio is also called the odds ratio.³⁵⁷

The obvious competing hypothesis to H_V is its mutually exclusive negation, H_{NV} . This particular competing hypothesis was already addressed above. The probability ratio between H and H_{NV} is given by

$$p(H_V|e)/p(H_{NV}|e)=[p(e|H_V)p(H_V)/p(e)]/[p(e|H_{NV})p(H_{NV})p(e)].$$

As we can see, $p(e)$ can now be eliminated as it appears both in the numerator and denominator. This gives us the following equation:

$$p(H_V|e)/p(H_{NV}|e)=[p(e|H_V)p(H_V)]/[p(e|H_{NV})p(H_{NV})].$$

With some rearrangement, we get

$$p(H_V|e)/p(H_{NV}|e)= [p(e|H_V)/p(e|H_{NV})]*[p(H_V)/p(H_{NV})].$$

Thus, the extent to which the evidence increases or decreases the original probability ratio is dependent on how probable the evidence is given the two hypotheses. The change in the probability ratio is dependent on which hypothesis the evidence is most consistent with. If $p(e|H_V)/p(e|H_{NV})>1$, e supports H_V relative to H_{NV} . If $p(e|H_V)/p(e|H_{NV})<1$, e contradicts H_V relative to H_{NV} . If $p(e|H_V)/p(e|H_{NV})=1$, the evidence is neutral and provides no information. Another way to say this is that if $p(e|H_V)>p(e|H_{NV})$, e supports H_V relative to H_{NV} , and if

³⁵⁷ The odds ratio between two probabilistic events such as which of the teams A or B wins the soccer match is $r=p(A)/p(B)$. The interpretation of this ratio is that team A is r times as much likely to win the match as team B. In odds terms this is often written 1:r. In a fair bet, someone who bets on A receive one if A wins, but must pay r to the opponent if B wins. The ratio is always positive, but can be less than or equal to one, depending on which event is most probable.

$p(e|H_V) < p(e|H_{NV})$, e contradicts H_V relative to H_{NV} . Consistency of evidence with a hypothesis is the likelihood of evidence given the hypothesis. Assume, for instance, that in a price conspiracy case we observe that all suspected companies changed their prices with the exact same amount at the exact same time over a two year period. Is this evidence more likely given that there was a price conspiracy going on, or is it more likely without a price conspiracy? If it is more likely with a conspiracy than without a conspiracy the evidence supports price conspiracy, relative to not price conspiracy.

$p(e|H_V)/p(e|H_{NV})$ is called the likelihood ratio between H_V and H_{NV} . The likelihood ratio is an important concept in scientific evidential inference. The “likelihoodists” of philosophy of science stress the use of likelihood ratios as the scientifically correct method of assessing evidence.³⁵⁸ The likelihood ratio is a measure of the extent to which evidence supports a hypothesis relatively to a competing hypothesis.

If we look back, we see that testing if $p(e|H_V)$ is greater or less $p(e|H_{NV})$ is also a logical equivalent to testing probative force of e on H_V directly without going via H_{NV} . This is not surprising. As $p(H_V)=1-p(H_{NV})$, analyzing the impact of evidence on $p(H_V)$ directly and relative to $p(H_{NV})$ is basically the same. This changes when we use the probability ratio between non-exhaustive hypotheses.

Let us now generalize and assume that the two competing hypotheses are H_1 and H_2 . H_1 and H_2 are not necessarily exhaustive. In antitrust analysis, H_1 could, for instance, be a hypothesis of violation according to one specific theory of harm, while H_2 is a hypothesis of not violation based on one specific theory of efficiencies. By the same calculations used just above, we have

$$p(H_1|e)/p(H_2|e)=[p(e|H_1)/p(e|H_2)]*[p(H_1)/p(H_2)].$$

The question of whether the evidence relatively supports H_1 or H_2 is dependent on which hypothesis is most consistent with evidence. If $p(e|H_1)/p(e|H_2) > 1$, the evidence supports H_1 relative to H_2 . If $p(e|H_1)/p(e|H_2) < 1$, the evidence supports H_2 relative to H_1 . If $p(e|H_1)/p(e|H_2) = 1$, the evidence is neutral. $p(e|H_1)/p(e|H_2)$ is the likelihood ratio that measures how much more or less evidence supports H_1 relative to H_2 . Let us, for example, say that we scrutinize an agreement on exclusive purchasing between a wholesaler and a retailer. The two competing hypotheses are, on the one hand, that the agreement restricts competition on the

³⁵⁸ See Achinstein (2001) p. 125 for the argumentation. See also Sober (2008) p. 32 f.

wholesale level and, on the other hand, that the purchaser wants to realize efficiencies from economies of scale in procurement, and by this obtain lower input prices. Let us say that evidence present shows a large upfront payment from the wholesaler to the retailer before the agreement was entered into. Is the evidence more likely given the anticompetitive explanation or given the specific efficiency explanation? This will be determining for the likelihood ratio.

With two non-exhaustive competing hypotheses, the likelihood ratio only says which of the hypotheses evidence relatively supports. It might be a third unknown hypothesis that the evidence supports even more. For instance, even though the evidence might support the anticompetitive hypothesis more than the efficiency hypothesis, there might be a third competing efficiency hypothesis based on another efficiency theory that is even better supported by the evidence. Some might try to exploit this point to manipulate an irrational decision maker's assessment of evidence. An irrational decision maker might be manipulated to believe that a hypothesis is most probable since it is more probable than a competing hypothesis. This would be an abuse of rhetoric. The abuse of rhetoric will be discussed in the discussion of actual evidence assessment below.

What the likelihood ratio between H_1 and H_2 , $p(e|H_1)/p(e|H_2)$, does is to update the a priori probability ratio $p(H_1)/p(H_2)$ to the a posteriori probability ratio $p(H_1|e)/p(H_2|e)$. The likelihood ratio $p(e|H_1)/p(e|H_2)$ is the update factor. This means that if we, for instance, a priori considered H_1 to be half as probable as H_2 , and we then find the likelihood ratio to be two (the evidence is twice as likely given H_1 than given H_2), then H_1 and H_2 are equally probable a posteriori. If, however, we, for instance, a priori considered H_1 to be one hundredth as probable as H_2 , and we then find the likelihood ratio to be two, then H_1 is one fiftieth as probable as H_2 a posteriori. Thus, even though likelihood ratios can tell us how much an a priori probability ratio must be adjusted in light of the evidence, it say nothing, as such, about which hypothesis is most probable. The same likelihood ratio equal to two can both update a hypothesis from being half as probable to be equally probable and a hypothesis from being one hundredth as probable to being one fiftieth as probable. At the end of the day, we are interested in knowing how probable a hypothesis is, or at least which hypothesis is most probable. For this, we need to have some ideas on the a priori probabilities. As mentioned above, the failure to take into account the a priori probability in assessing evidence is referred to as the base rate fallacy, which will be explored further in the discussion of cognitive biases below.

Some critics on probabilistic inference in legal assessment of evidence

The use of probability calculus as a method of assessing legal evidence has not been without critics.³⁵⁹ It is easy to agree with the critics related to the use of probability calculus as a descriptive theory of how people actually assess evidence.³⁶⁰ This topic will be addressed properly in the section on actual evidence assessment in antitrust below. The study of behavioral economics has, for instance, revealed that persons are prone to significant cognitive biases in the assessment of evidence.³⁶¹ However, that probability calculus is not a good description of how evidence in a legal context is actually assessed does not make it less valuable to analyze how a rational decision maker should assess evidence. This can give normative guidance to how evidence should be assessed, which can guide judges and others when they assess evidence. Furthermore, it can guide the design of procedural principles and rules. Rational assessment of evidence is also an important benchmark to assess the performance of actual decision making.

Another objection to the use of probability calculus in evidence assessment could be that when witnesses express themselves in probability terms, they might have no idea what they are talking about. As a consequence, probability calculus using probability statements expressed by witnesses are wrong. However, there are counterarguments to this objection. The possibility of irrationality in witness statements can be handled in a rational way. Assume that a witness is not coherent in his statements. Coherence is simply that people are consistent in the handling of probabilities, as described in Chapter Three. Assume that a witness of a robbery is asked with what probability he thinks that the robber is a man. To this, he replies that he is 40 percent sure that it was a man. On the question on the probability that the robber is a woman, he replies that he is 30 percent sure that the robber is a woman. This is incoherent as the sum is less than 100 percent. Probably, he replies this because of a general feeling of uncertainty. A way to handle this lack of coherence in the witness statement is to look at the probability ratio. According to the witness, $p(\text{robber is man})=0.4$ and $p(\text{robber is woman})=0.3$. This gives $p(\text{robber is man})/p(\text{robber is woman})=1.33$. Thus, according to the witness, the ratio of man to woman is 1.33:1. Transformed to probabilities, this gives $p(\text{robber is man})=0.57$ ($1.33/2.33$) and $p(\text{robber is a woman})=0.43$.

³⁵⁹ See, for instance, Allen (2003), Stein (2011), Graver (2009), and Anderson et al. (2005) p. 246 f.

³⁶⁰ However, by this it is not meant that probability models can be used as an instrumental model of actual evidence assessment. This will be done in the economic modeling of evidence assessment below.

³⁶¹ The behavioral economics literature was described in the analytical framework chapter and will be returned to below.

The probabilistic approach to decision making discussed above has also been criticized on normative grounds. Mainstream decision theory has been criticized for its handling of causality by proponents of causal decision theory.³⁶² Simplified, one can say that proponents of causal decision theory only acknowledge beliefs based on causal connections. General empirical evidence is not relevant as long as it is not casually connected to the probability we want to assess. Stein (2011) uses causal decision theory to argue for a flawed probabilistic foundation of law and economics based on the mainstream decision theory used in this study. Stein (2011) seems to interpret mainstream decision theory wrongly. In mainstream decision theory, it is rational to take into account all relevant information. General empirical evidence provides information that might be refuted by some more context-specific causally related evidence. The further philosophical details on the distinction between mainstream decision theory and causal decision theory will not be discussed here. All evidence whether it is based on pure empirical induction or case specific causal inference are considered relevant in accordance with mainstream decision theory. The question is to what extent evidence is informative in making better decisions. Methods of assessing the informative value of empirical evidence will be returned to in the discussion on the use of statistics and econometrics in Chapter Six.

5.2.4 Some additional insight on probability and probative force

The use of conditional probabilities, Bayes' theorem, probability ratios, and likelihood ratios to derive numerical and relative measures of probative force of evidence are chief instruments in the rational assessment of probabilities to achieve rational decisions. Some additional insight from probability theory in calculating the probative force of evidence is presented in this subchapter. The purpose is to give some additional insight on the rational assessment of probative force in some situations where there is a risk of fallacies in actual evidence assessment. This will provide valuable insight for the discussion on actual evidence assessment in antitrust below.

Multiple evidence and probative force

So far, we have been concerned with some evidence, e , which might include many pieces of evidence. The evidence can be separated into a set of evidence elements e_1, \dots, e_n ,³⁶³ which are

³⁶² See Martin (2009) p. 187 f. for an introduction to causal decision theory. Causal decision theory is strongly related to the problem of induction discussed above.

³⁶³ For convenience e_1, \dots, e_n is written instead of $e_1 \cap \dots \cap e_n$, but the meaning is the same.

also elements that could possibly be separated further into sub-elements. The evidence in most legal cases consists of a combination of elements, some that might support each other and some that might contradict each other. In the assessment of a combination of evidence, each element of evidence may have stand-alone probative force, but the combination of evidence will often have probative force exceeding the sum of the probative force of each element assessed independently. Evidence of some oddly correlated behavior in a market and information exchange might each independently have positive probative force for the hypothesis of price conspiracy. The combination of the two elements of evidence might, however, have higher probative force than the sum of their individual contributions.

An illuminating example outside antitrust is to assume that there has been an old-fashioned bank robbery. The robber was observed by a witness to have red hair, a big tattoo on his left arm and a mole at the right cheek. All this observed characteristics might be considered as evidence against a suspect that satisfies these characteristics. However, each element, individually, will have weak probative force. Many have red hair, many have a big tattoo on the left arm, and many have a mole on the right cheek. The evidence of a suspect satisfying all these characteristics in combination has much stronger probative force against the suspect than each characteristic separately. It is far less likely to find all these characteristics in some random person than each of the individual characteristic considered separately.

Multiple evidence does not change the formulas derived above. We can write:

$$p(H_V|e_1,...,e_n)=p(H_V \cap e_1,...,e_n)/p(e_1,...,e_n)=p(e_1,...,e_n|H_V)p(H_V)/p(e_1,...,e_n).$$

Similarly, we can write the probability ratio between H_V and H_{NV} , given e , as:

$$p(H_V|e_1,...,e_n)/P(H_{NV}|e_1,...,e_n)=[p(e_1,...,e_n|H_V)/p(e_1,...,e_n|H_{NV})]*[p(H_V)/p(H_{NV})].$$

More generally, the probability ratio between the two hypotheses H_1 and H_2 can be written as:

$$p(H_1|e_1,...,e_n)/P(H_2|e_1,...,e_n)=[p(e_1,...,e_n|H_1)/p(e_1,...,e_n|H_2)]*[p(H_1)/p(H_2)],$$

where $p(e_1,...,e_n|H_1)/p(e_1,...,e_n|H_2)$ is the likelihood ratio.

So far, we have just replaced e with e_1, \dots, e_n . What is interesting is to know how to rationally assess the information in the combination of evidence. How is the probability of a combination of evidence related to the separate probabilities of the single pieces of evidence? For simplicity, it is assumed that there are two pieces of evidence: e_1 and e_2 . By the laws of probability, we have that $p(e_1, e_2) = p(e_1|e_2)p(e_2)$.³⁶⁴ Equivalently, since order does not matter, we have $p(e_1, e_2) = p(e_2|e_1)p(e_1)$. Conditional on H_V , the same probabilities become $p(e_1, e_2|H_V) = p(e_1|e_2, H_V)p(e_2|H_V)$ and $p(e_1, e_2|H_V) = p(e_2|e_1, H_V)p(e_1|H_V)$. Needless to say, given H_{NV} , the same probabilities become $p(e_1, e_2|H_{NV}) = p(e_1|e_2, H_{NV})p(e_2|H_{NV})$ and $p(e_1, e_2|H_{NV}) = p(e_2|e_1, H_{NV})p(e_1|H_{NV})$, respectively.

In legal evidence, it is usual to talk about evidence that support or contradict each other. It is usual to talk about “corroborative” evidence as pieces of evidence that support each other and of “contradictory evidence” or “conflicting evidence” where the pieces of evidence are contradictory with each other.³⁶⁵ Intuitively, evidence that supports H_V can be said to be supportive to other evidence that supports H_V . Evidence that contradicts H_V can be said to be contradictory to evidence that supports H_V . The formulas outlined above can be used to elaborate on what this means. Recall that evidence has probative force in support of, or contradictory to, H_V dependent on whether the likelihood ratio $p(e_1, e_2|H_V)/p(e_1, e_2|H_{NV})$ is larger or less than 1.

Assume that e_1 standalone supports H_V , which means that $p(e_1|H_V)/p(e_1|H_{NV}) > 1$. We have

$$p(e_1, e_2|H_V)/p(e_1, e_2|H_{NV}) = [p(e_1|H_V)p(e_2|e_1, H_V)]/[p(e_1|H_{NV})p(e_2|e_1, H_{NV})].$$

We can see that the presence of e_2 in addition to e_1 increases the probative force in support of H_V and only if $p(e_2|e_1, H_V)/p(e_2|e_1, H_{NV}) > 1$. This means that, if the probability of e_2 given e_1 is higher if H_V is true than not true, then e_2 will support e_1 , which means that the probative force of the total evidence becomes stronger. In other words, if it is more likely that we observe e_2 given that we have observed e_1 when H_V is true than not, and we actually observe e_2 , then the probative force of evidence in support of H_V increases by observing e_2 . On the contrary, if it is less likely that we observe e_2 given that we have observed e_1 given that H_V is true than not, and we actually observe e_2 , then the probative force of evidence in support of H_V decreases by observing e_2 .

³⁶⁴ We know from the laws of probability that $p(A \cap B) = p(A|B)p(B)$. This can be used on $p(e_1, e_2)$.

³⁶⁵ See Anderson et al. (2005) p. 69-70.

If e_2 is independent of e_1 both if H_V is true and not true, the formula above can be reduced to $p(e_1, e_2|H_V)/p(e_1, e_2|H_{NV})=p(e_1|H_V)p(e_2|H_V)/p(e_1|H_{NV})p(e_2|H_{NV})$.³⁶⁶ This means that a combination of two independent elements of evidence that both have standalone probative force in support of H_V will have higher probative force than knowing only one of the evidence elements. In other words,

$$p(e_1, e_2|H_V)/p(e_1, e_2|H_{NV}) > \max \{p(e_1|H_V)/p(e_1|H_{NV}), p(e_2|H_V)/p(e_2|H_{NV})\}.$$

This means that having two supportive independent elements of evidence is better than having only the better of the two. Opposite, if two independent elements of evidence that both have standalone probative force in contradiction of H_V , their combination contradict H_V even more. Assume we have two elements of independent evidence where one has stand-alone probative force in support of H_V and one has probative force contradicting H_V . This means $p(e_1|H_V)/p(e_1|H_{NV}) > 1$ and $p(e_2|H_V)/p(e_2|H_{NV}) < 1$. Then, the probative force of the combination of the evidence is somewhere between the two, where the direction of the probative force is dependent on which of the two pieces of evidence has the strongest probative force.

On the other extreme side, assume that evidence e_2 deductively follows from e_1 either if H_V is true or not. This means that $p(e_2|e_1, H_V)=1$ and $p(e_2|e_1, H_{NV})=1$. The second evidence is only a logical consequence of the other. For instance, e_1 might be evidence that two companies have had identical prices for the last three months, while e_2 is the evidence that they had identical prices last month. Then, we will have

$$p(e_1, e_2|H_V)/p(e_1, e_2|H_{NV})=p(e_1|H_V)p(e_2|e_1, H_V)/p(e_1|H_{NV})p(e_2|e_1, H_{NV})=p(e_1|H_V)/p(e_1|H_{NV})$$

The probative force is not changed by the new element of evidence. In this example the deductively dependence was quite obvious. In other situations, it might not be so obvious that one element of evidence is just some logical consequence of the other.

The lesson from this exercise is that the dependence of evidence must be taken properly into account in the rational assessment of the probative force of a combination of evidence. To avoid being confused by the quantity of evidence, one must critically ask the probability of observing the additional evidence given the existing evidence. For instance, two econometrical analyses based on the same data will be highly dependent. If two econometric

³⁶⁶ If A and B are independent, then $p(A \cap B)=p(A|B)p(B)=p(A)p(B)$.

experts present coinciding econometric conclusions based on the exact same data and method, the probative force of the analysis from the second expert is limited, especially if the experts are “instructed” on the data and method to apply.

A subtle issue associated with dependence and combination of evidence that might run counter to intuition is the “Simpson’s paradox.”³⁶⁷ An example is best to illustrate this. Assume that observation shows that there is a tendency of antitrust convicts to have higher education than the population in general. Let H_V be the hypothesis that the suspect is guilty of antitrust violation and e be the evidence that the suspect has higher education. Thus, $p(H_V|e) > p(H_V)$. Now, assume m is the evidence that the suspect is in top level management. We might well have that $p(H_V|e,m) < p(H_V|m)$ and $p(H_V|e, \text{not } m) < p(H_V|\text{not } m)$. This might seem like a paradox. A higher education increases the probability of being guilty of an antitrust violation, but reduces the probability of guiltiness regardless of whether the suspect is in top level management or not. The explanation is simple. Observing higher education increases the probability that a person is in top level management, and being in top level management increase the probability of antitrust violation as a matter of opportunity. However, top level managers with higher education might be more law abiding than top level management without higher education.³⁶⁸ Thus, if we have the two elements of evidence: higher education and top level management, both might unconditionally seem to support the hypothesis that a person is guilty of an antitrust violation. In this example, however, higher education is contradictory evidence to violation given that the evidence that the suspect is top level management is taken into account. This is a causality issue that will be returned to below. The lesson from this is to always have the picture of total evidence in mind when assessing evidence. Using non-conditional probabilities of evidence where the presence of evidence are dependent not only gives a wrong measure of probative force, it might also even give a wrong direction of the probative force.

Probative force and multiple criteria to be proved

A legal hypothesis concerning a violation of law will usually consist of several cumulative or alternative conditions that must be proved. For each of these conditions, evidence must be assessed. For instance, in the assessment of abuse of dominant position in EU competition law, both dominance and abuse must be proved. These are cumulative criteria. When, for instance, the anticompetitive effects of a merger are scrutinized, increased unilateral market

³⁶⁷ See Pearl (2009) p.174 f. and Simpson (1951).

³⁶⁸ Or opposite. This is just an example for illustration.

power and the possibility of coordinated behavior are alternative facts that might lead to a prohibition.

When it comes to cumulative conditions that must be satisfied, the question is what the probability that all the cumulative terms are satisfied is. How is this related to the probability of the satisfaction of each condition individually? Let H_V be the hypothesis that all the cumulative criteria, Z_1, \dots, Z_n , are satisfied, which means that $H_V = Z_1 \cap \dots \cap Z_n$. For simplicity, it is assumed that $n=2$. This means that $H_V = Z_1 \cap Z_2$. By using the formula on conditional probabilities, we have that

$$p(Z_1 \cap Z_2) = p(Z_1 | Z_2) p(Z_2),$$

and since order doesn't matter,

$$p(Z_1 \cap Z_2) = p(Z_2 | Z_1) p(Z_1).$$

When Z_1 and Z_2 are independent, this simplifies to

$$p(Z_1 \cap Z_2) = p(Z_1) p(Z_2).$$

The cumulative conditions are seldom independent in legal hypotheses. In, for instance, a case on abuse of dominance, the probability of abuse is not independent of the probability of dominance.³⁶⁹ In the assessment of a merger, the probability of anticompetitive effects is not independent of the probability of harm to consumers. We must then apply the more advanced formula above. When there is a positive dependency between the criteria, which means that the probability of one criterion increases in the presence of the other, the use of independent probabilities will give a too low an assessment of the cumulative probabilities.³⁷⁰ Conversely, if we assume there is a negative dependency between the criteria, which means that the probability of one criterion reduces in the presence of the other, the use of independent

³⁶⁹ Some of the same evidence applies to the two criteria. The abusive act might even be evidence in the test for dominance.

³⁷⁰ If $p(Z_1 | Z_2) > p(Z_1)$ then $p(Z_1 | Z_2) p(Z_2) > p(Z_1) p(Z_2)$.

probabilities will give too high an assessment of the cumulative probability.³⁷¹ Failing to take this into account will give a too high estimate when “doubt is accumulated” in a legal context.

To illustrate the importance of dependencies, assume that a merger is scrutinized. The probability that the merger restricts competition is 0.8. This means that $p(Z_1)=0.8$. Furthermore, assume the probability that the merger harms consumer welfare, given that it restrict competition, is also 0.8, which means that $p(Z_2|Z_1)=0.8$. However, assume that the probability that the merger harms consumer welfare is 0.2 when not conditioned on the restriction of competition. This means that $p(Z_2)=0.2$. Without taking into account the dependence, one might easily conclude that the merger does not restrict competition as $p(Z_1)p(Z_2)=0.16$. This would be a fallacy. The probability that the merger is harmful to consumer welfare, assuming that restriction of competition is the only cause for such harm, is $p(Z_1)p(Z_2|Z_1)=0.64$.

The impact of the dependence between the cumulative criteria is important in the rational assessment of the probative force of evidence. If the same evidence has probative force for both of the two cumulative criteria, then the probabilities of the two criteria are positive dependent on each other. This is particularly relevant in competition law as the same evidence is often relevant for many of the cumulative criteria necessary to establish violation. The same evidence can be relevant in determining the relevant market, the assessment of market power, and the effects of some conduct. All doubt associated with these criteria cannot be accumulated as if the criteria were independent.

Above it was assumed that the conditions were cumulative. Now, assume that the conditions are alternative. At least one criterion must be satisfied for the law to apply. For simplicity, assume that one of two alternative criteria, A_1 and A_2 , must be established. This means that the hypothesis, H_V , is that at least one of the criteria are satisfied. This can be written as $H_V=A_1 \cup A_2$. Probability calculus gives us that $p(A_1 \cup A_2)=p(A_1)+p(A_2)-p(A_1 \cap A_2)$. As explained in Chapter Three, the probability that both criteria are satisfied, $p(A_1 \cap A_2)$, must be deducted to not be counted twice.

Assume that A_1 and A_2 are the alternative factual criteria for a merger to restrict competition, which are unilateral effects or coordinated effects. If the probabilities of each of these conditions are 40 percent, the probability that at least one of the conditions is fulfilled is 80 percent, minus the probability that both conditions are satisfied at the same time. If these

³⁷¹ If $p(Z_1|Z_2)<p(Z_1)$ then $p(Z_1|Z_2)p(Z_2)<p(Z_1)p(Z_2)$.

conditions are mutually exclusive, as it is usual to assume in antitrust, there will be an 80 percent chance that the competition is restricted. Thus, without any further investigation we can say that it is 80 percent chance that the merger restricts competition. Assuming no offsetting benefits, the merger should be prohibited according to balance of probabilities standard, even where no theory of harm has been established according to the balance of probabilities.

It is not difficult to predict a lawyer's objection to this logic. This would be that it is the facts that are used as basis for the decision that must be proved according to balance of probabilities. The lawyer would argue that you cannot sum the probability of alternative facts that that would satisfy the legal criterion for prohibition. This argument could represent a logical fallacy, though, and could lead to a wrongful assessment of the probative force of the evidence of alternative facts. The validity of the argument depends on the condition established by the law. If the legal criterion is that competition is restricted, this criterion is satisfied according to the standard of proof. Analytical exercises on the way to prove that the legal criterion is satisfied, such as dividing the analysis into unilateral effects or coordinated effects, should not affect the outcome. It can be a coincidence how the legal criterion is divided into various sub-criteria. It has, for instance, no impact on the legal criterion if the merger agreement is signed by the right or left hand. In principle, one can say that in the same way it has no impact on the fulfillment of the legal condition whether the restriction of competition follows from unilateral or coordinated effects.³⁷² When facts are assessed, there are always factual circumstances that are not scrutinized since they have no influence on the result. Normally, and as will be shown below, it is a waste of resources to scrutinize factual circumstances that have no impact on the decision.

Probability and causal inferences

The counterfactual analysis is the basis for the assessment of causality in legal contexts. Most developed jurisdictions use a "but for" assessment as the starting point for assessing causality in the determination of legal liability.³⁷³ This includes antitrust liability.³⁷⁴ Thus, the relevant criterion for finding causality is whether an event is a necessary cause for the effect. Tort law is illustrative for this concept. In tort law, the causality between the harmful act and the harm

³⁷² In practice, it might have impact on what kind of commitments might remedy the anticompetitive effects. For this reason, it might be necessary to analyze carefully how the anticompetitive effects materialize.

³⁷³ See Fumerton and Kress (2001).

³⁷⁴ See Abele et al. (2011). See Carrier (2011) for an in-depth analysis of the causation standards in US antitrust law.

is determined by the assessment of whether the harm would be present if the harmful act were assumed away. If it would not, causality is inferred. The question is whether the harmful act was necessary for the harm.

Thus, the necessary cause requirement is the starting point for assessing anticompetitive effects of some conduct in antitrust law. In determining whether, for instance, some agreement has anticompetitive effects, it must be assessed whether the agreement is necessary for a restriction of competition.³⁷⁵ The counterfactual approach also applies to merger control, as the counterfactual in determining whether a merger result in a significant impediment of competition (SIEC) in the EU or a substantial lessening of competition (SLC) in the US. For this assessment of anticompetitive effects in antitrust, the use of presumptions rules are crucial in both US and EU as explained in Chapter Four.

The necessary cause principle used in the counterfactual “but for” assessment is, however, just a starting point for assessing liability. The test might be both over-inclusive and under-inclusive in determining legal liability depending on the specific circumstances. In some circumstances, an act is considered as a liable cause even it was not likely to be necessary for the effects. This can be illustrated by an example from antitrust law. Assume that a market consist of three suppliers: A, B, and C. The suppliers A and B enter into an agreement which restricts competition. Assume that A is able to prove that if A and B had not entered into an agreement, then B and C would have entered into an agreement with the same anticompetitive effects on the market. A would probably not get far with the defense that the agreement between A and B is not necessary for the anticompetitive effects as B and C in the absence of the agreement between A and B would have entered into an agreement with the same effects in the market.

An example showing that some act that is necessary for some anticompetitive effect may not be considered as a liable cause can also be picked from antitrust law. Assume, like above, that competitors A and B have entered into an anticompetitive agreement. The last competitor in the market, C, observes that A and B suddenly start to behave less aggressively, and decides to adapt to the less aggressive behavior by competing less aggressively. Though C might have his suspicions as to some coordination between A and B, he is not in any communication with A or B. The behavior of C is necessary for the anticompetitive effects of the agreement between A and B. C will, however, hardly be liable for those effects. That an act is a necessary cause seems to be neither a necessary nor sufficient condition for

³⁷⁵ For the application of TFEU Article 101, see, for instance, Whish (2009) p. 124. See Carrier (2011) and Gellhorn et al. (2004) p. 191 f. for the analysis of effects of horizontal agreements in US.

establishing liability.³⁷⁶ Thus, some additional criteria to just establishing necessary cause are necessary for establishing liability. Requirements of intent or negligence and requirements of proximity narrow the amount of liable actions. Rules on attempt and contribution expand the amount of liable actions. From a law and economics perspective, a risk should be placed on the one who can deal with it most efficiently. By placing the liability for acts that might cause harm with the one who can prevent the harm at the lowest cost, the harm will be avoided to the lowest cost given that it is efficient to avoid the harm.³⁷⁷

Still, the requirement of necessary cause is the starting point of establishing liability. The question that will be discussed here is how the concept of necessary cause should be addressed in a rational probabilistic sense. In this section the principles will be discussed. Inferring causality from empirical analyses will be returned to in Chapter Six. Some rather complex calculations will be needed to achieve the results of this section. However, the results in the end will be intuitively appealing.

The probability that X is a necessary cause of Y is the probability that X is necessary for Y to incur. This is the same as the probability that if X does not occur then Y will not occur. To address the causality question it is conditioned on that X=true and Y=true.³⁷⁸ The probability that X is a necessary cause of Y can be written as:

$$PN(X,Y)=p(Y=false \text{ when } X=false|X=true,Y=true)^{379}$$

To develop this formula further it is necessary to go via the sufficient cause concept. The probability that X is a sufficient cause of Y is the probability that the effect Y occurs when X has occurred independent on other circumstances that might affect Y. We condition

³⁷⁶ There have been attempts to create objective requirements on causality that can be used to assess liability. The legal philosopher J.L. Mackie developed the co-called INUS-criterion (Insufficient but Necessary part of an Unnecessary but Sufficient set of Conditions). See Mackie (1965), Pearl (2009) p. 313 f., and Sloman (2005) p. 29 f. This was developed further by the legal philosopher R. Wright who suggested the simpler definition of the INUS-condition called the NESS-condition (Necessary Element of Sufficient Set and NESS-criterion). See Wright (1988) and Pearl (2009) p. 314. NESS defines the actual cause as a necessary element of a sufficient set of conditions for the effect. From the first example above, we see that the agreement between A and B is a necessary element of the sufficient of conditions for the anticompetitive effect to materialize, but the potential agreement between B and C is not such a necessary condition. The anticompetitive effects were realized without any such agreement. Thus, the agreement between A and B satisfy the NESS-condition, but the NESS-condition screens off the potential agreement between B and C as an actual cause. However, the NESS-condition fails to screen off the behavior of C as an actual cause in the second example, as the conduct of C is a necessary element of the sufficient conditions for the anticompetitive effects. Thus, the NESS-criterion has been criticized in the literature to fit as a uniform objective definition of causality suitable for establishing liability. See Fumerton and Kress (2001).

³⁷⁷ See Posner (2011) p. 213 f.

³⁷⁸ If we not make this assumption we cannot know if the lack of Y is the result of lack of X.

³⁷⁹ See Pearl (2009) p. 286.

on $X=false$ and $Y=false$ to address the causality question as above. The probability that X is a sufficient cause of Y can then be written as:

$$PS(X,Y)=p(Y=true \text{ when } X=true|X=false,Y=false).^{380}$$

The probability that X is both a necessary and sufficient cause of Y can be written as

$$PNS(X,Y)=p(Y=true \text{ when } X=true,Y=false \text{ when } X=false).^{381}$$

It can be shown by normal rules of probability that

$$PNS(X,Y)=p(X=true,Y=true)PN(X,Y)+p(X=false,Y=false)PS(X,Y).^{382}$$

If X is exogenous relative to Y , the calculations can be simplified. Exogeneity means that if X is fixed directly by direct manipulation, it has the same effect on Y as if the same value of X had occurred without manipulation. With some risk of vagueness, one can say that there are no confounding variables that both affect Y via X and by other means.³⁸³ In an antitrust context, exogeneity can be exemplified with a merger. A structural change in the market such a change in the technology might change the optimal size of the firms in the market. Thus, “forcing” the merger might not have the same effects as if the merger was performed without force, but instead because of technological changes. The merger can be made exogenous by narrowing the analysis to the new technological circumstances. If X is exogenous relatively to Y , we have:

$$p(Y=true \text{ when } X=true)=p(Y=true|X=true).^{384}$$

With some calculations, and assuming exogeneity, we can derive the following:³⁸⁵

$$PN(X,Y)=PNS(X,Y)/P(Y=true|X=true) \text{ and } PS(X,Y)=PNS(X,Y)/P(Y=false|X=false).$$

³⁸⁰ See Pearl (2009) p. 286.

³⁸¹ See Pearl (2009) p. 286.

³⁸² See Pearl (2009) p. 287.

³⁸³ See Pearl (2009) p. 246 f. for various descriptions of exogeneity. The discussion of exogeneity will be returned to in Chapter Six.

³⁸⁴ When the condition of exogeneity is satisfied, it is possible to condition on X without affecting the probability. This means: $p(Y=true \text{ when } X=true)=p(Y=true \text{ when } X=true|X=true)=p(Y=true|X=true)$. See Pearl (2009) p. 289.

³⁸⁵ See Pearl (2009) p. 291.

To simplify the calculations further, the assumption of monotonicity is introduced.³⁸⁶ That Y is monotonic relative to X means that if X is changed from false to true, then Y cannot change from true to false. This means that X=true cannot be a cause of Y=false. An antitrust example of monotonicity would be that some agreement is only able to restrict competition and never promote it. Most antitrust practitioners know that very few practices are only able to restrict competition. Almost all agreements can promote competition in some circumstances. Thus, as for exogeneity, the analysis must be narrowed to the right circumstances to achieve monotonicity.

In the presence of both exogeneity and monotonicity between X and Y, we get

$$PNS(X,Y)=p(Y=true|X=true)-p(Y=true|X=false).^{387}$$

The probability that X is a necessary and sufficient cause of Y is the probability that Y=true given that X=true minus the probability that Y=true given that X=false. By combining the results above, we get

$$\begin{aligned} PN(X,Y) &= \\ PNS/p(Y=true|X=true) &= \\ [p(Y=true|X=true)-p(Y=true|X=false)]/p(Y=true|X=true) \end{aligned}$$

From this formula, it follows that in the presence of exogeneity and monotonicity between X and Y, the probability that X is a necessary cause of Y is the difference between the probability that Y is true given that X is true and the probability that Y is true given that X is false relative to the probability that Y is true given that X is true. Briefly, this can be described as the relative extra risk of Y following from X. This result is of crucial importance for rational analysis of legal evidence in general, and antitrust evidence analysis in particular. Let C denote some conduct under scrutiny and A be the anticompetitive effect. Then we have

$$PN(A,C)=[P(A=true|C=true)-P(A=true|C=false)]/P(A=true|C=true)$$

To figure out the probability that C is a necessary cause for the anticompetitive effects, A, we need both the probability of anticompetitive effects given the presence of the conduct and the

³⁸⁶ See Pearl (2009) p. 291 f.

³⁸⁷ See Pearl (2009) p. 291.

probability of anticompetitive effects in the absence of the conduct. The assumption of exogeneity and monotonicity must be valid for this equation to be valid. This means that we must narrow our analysis to ensure that the conduct can be considered as exogenous and monotone relative to the anticompetitive effects to utilize the simple formula above. More complicated formulas can be derived if these assumptions are violated. However, this is beyond the scope of this study.³⁸⁸

The formula above presents some intuitive valuable insight that can best be described with an example outside antitrust. Assume first that exogeneity and monotonicity are satisfied. Assume that given that the use of some specific substance is used in the production of food the probability of injury in a person is 0.003 (0.3 percent). Without the substance, the probability of injury is 0.001. Then, the probability that the substance is a necessary cause for the injury is $(0.003-0.001)/0.003=0.002/0.003=2/3=0.67$. Thus, the probability that the substance is the necessary cause is 67 percent. By the abuse of rhetoric, one can make it sound intuitively unappealing that the substance can be the necessary cause of the injury when the probability of the injury is only 0.3 percent. However, rational calculations reveal that it is actually a 67 percent chance that the substance was a necessary cause of the injury.³⁸⁹ The discussion of abuse of rhetoric will be returned to below.

Crucial for the calculation example above is exogeneity and monotonicity. The simple formula will not work if there is some common factor both affecting the consumption of the substance and the injury. If, for instance, the substance is known to reduce the risk of peptic ulcer it is not unlikely that some person in the risk zone of peptic ulcer eat food with this substance with the purpose of reducing the risk of peptic ulcer. In this case, both the assumption of exogeneity and the assumption of monotonicity of are violated. The assumption of exogeneity is violated because there is a common factor, the person's particular exposure to peptic ulcer, which both affect the consumption of the substance and the probability of peptic ulcer. Furthermore, if there is a chance that the substance reduces the probability of peptic ulcer, the condition of monotonicity is not satisfied. Thus, it is unlikely that the substance is a necessary cause of peptic ulcer. It is not likely that the problem due to the absence of exogeneity and monotonicity could be helped by narrowing the circumstances for the analysis, as narrowing the analysis might show that the substance reduces the risk of

³⁸⁸ See Pearl (2009) p. 293 f.

³⁸⁹ The intuition is quite clear when comparing it to a lottery or other small probability events. Although there is a very low chance to win the lottery, there is a high probability that playing the lottery was a necessary cause for winning. The probability that playing the lottery was a necessary cause is not 100 percent, though, because you might win because someone intentionally or unintentionally played in your name, or win because of some error.

peptic ulcer for all groups. This would be an example of the “Simpson’s paradox” explained above. Because of the correlation between the consummation of the substance and the occurrence of peptic ulcer, the substance may appear to cause peptic ulcer, but the truth is that it reduces the risk of peptic ulcer.

If we change the example a little, we can illustrate how to mitigate the problem of lack of exogeneity. Assume that the substance is known to increase the risk of peptic ulcer. In this case, it is likely also to be a violation of the assumption of exogeneity because people with a particular risk of getting peptic ulcer are likely to avoid the substance. Thus, the formula above may underestimate the true effect of substance as a necessary cause. The lack of exogeneity can now at least partly be helped by narrowing the analysis to persons outside the risk group, which means to control for this group or to base the probability on experimental studies that eliminate the problem with the lack of exogeneity.³⁹⁰ This brings us to the field of statistical analysis, which will be addressed in Chapter Six. The lesson for now is that, to rationally assess the probability of necessary cause, the issues of exogeneity and monotonicity must be dealt with rationally.

5.2.5 Decision value of evidence

Probative force and decision value

The probability part of rational evidence assessment was addressed above. Probability calculus was used to show the capability of evidence with probative force to resolve uncertainty about the truthfulness of a hypothesis. However, in the decision theoretic loss minimization framework presented above, reducing uncertainty is not a goal but a means for the minimization of expected losses from errors. Evidence is information that improves the accuracy of our decisions and reduces the expected loss of errors from a decision. The decision value of some evidence can be seen as its ability to reduce expected loss of errors of the decision.³⁹¹ The probative force of evidence is an input in determining the decision value of evidence.

Finding the decision value of evidence

Recall from above that, given some evidence, e , it will be rational to find violation if the expected loss of deciding violation is less than the expected loss of deciding not violation, which is $EL_V(e) < EL_{NV}(e)$. Given evidence, e , we have that $EL_V(e) = (1 - p(H_V|e))L_V$ and

³⁹⁰ Test persons should then be drawn randomly from the population.

³⁹¹ See Raiffa and Schlaifer (1961) and DeGroot (1984). See also Parmigiani and Inoue (2009) p. 255 f.

$EL_{NV}(e)=p(H_V|e)L_{VN}$, which makes it rational to find violation if $(1-p(H_V|e))L_V < p(H_V|e)L_{VN}$. The expected loss of a rational decision, given evidence, e , is then

$$EL(e)=\min[EL_V(e),EL_{NV}(e)]=\min[(1-p(H_V|e))L_V,p(H_V|e)L_{VN}].$$

Gathering evidence is also associated with costs, $c(\bar{E})$. A rational decision, including the decision on what evidence to gather, must minimize the sum of the expected losses from errors and the cost of gathering. This can be written as

$$\text{Min}_{\bar{E}} E_{\bar{E}}(EL(\bar{E})+c(\bar{E})),$$

which is equal to

$$\text{Min}_{\bar{E}} E_{\bar{E}}(\min[(1-p(H_V|\bar{E}))L_V,p(H_V|\bar{E})L_{NV}]+c(\bar{E})).$$

For now we will ignore the costs. The costs will be returned to below.

To illustrate the decision value of evidence, a simplified situation will be analyzed. Assume that there is only one possible evidence, \bar{E} , to gather, and this can have either the outcome e_V or e_{NV} . e_V has probabilistic probative force in support of H_V , and e_{NV} has probabilistic probative force in contradiction of H_V , which means that $p(H_V|e_V) > p(H_V) > p(H_V|e_{NV})$. We know from probability calculus that $p(H_V)=p(H_V|e_V)p(e_V)+p(H_V|e_{NV})p(e_{NV})$.

This means that the expected loss of the decision when evidence, \bar{E} , is not gathered is

$$\begin{aligned} EL= \\ \min[(1-p(H_V))L_V,p(H_V)L_{NV}]= \\ \min[(1-(p(H_V|e_V)p(e_V)+p(H_V|e_{NV})p(e_{NV})))L_V,(p(H_V|e_V)p(e_V)+p(H_V|e_{NV})p(e_{NV}))L_{NV}]. \end{aligned}$$

Let us then see what we can expect to gain by gathering \bar{E} . \bar{E} might turn out to be e_V , which has probability $p(e_V)$ or e_{NV} with probability $p(e_{NV})$. If e_V appears, the expected loss of our decision is $\min[(1-p(H_V|e_V))L_V,p(H_V|e_V)L_{NV}]$. If e_{NV} appears, then our expected loss will be

$\min[(1-(p(H_V|e_{NV})))L_V, p(H_V|e_{NV}))L_{NV}]$. Thus, when we have decided to gather \bar{E} , but before know what the outcome will be, our expected loss is

$$EL(\bar{E}) = \min[(1-(p(H_V|e_V)))L_V, p(H_V|e_V))L_{NV}]p(e_V) + \min[(1-(p(H_V|e_{NV})))L_V, p(H_V|e_{NV}))L_{NV}]p(e_{NV}).$$

The expected gain from gathering \bar{E} is

$$EG_d(\bar{E}) = EL - EL(\bar{E}).$$

The subscript d indicates the decision value of evidence.³⁹² Assume that deciding not violation is the loss minimizing decision when evidence is not gathered. This means that $EL = p(H_V)L_{NV} = (p(H_V|e_V)p(e_V) + p(H_V|e_{NV})p(e_{NV}))L_{NV}$. Logically, this means that deciding not violation also minimizes loss if \bar{E} turns to be e_{NV} . Under these assumptions, we get

$$\begin{aligned} EG_d(\bar{E}) &= \\ EL - EL(\bar{E}) &= \\ [p(H_V|e_V)p(e_V) + p(H_V|e_{NV})p(e_{NV})]L_{NV} - \\ [\min[(1-(p(H_V|e_V)))L_V, p(H_V|e_V))L_{NV}]p(e_V) + p(H_V|e_{NV})L_{NV}p(e_{NV})] &= \\ p(H_V|e_V)p(e_V)L_{NV} - \min[(1-(p(H_V|e_V)))L_V, p(H_V|e_V))L_{NV}]p(e_V). \end{aligned}$$

Now we can start calculating $EG_d(\bar{E})$. Assume that, even if e_V shows up, it is still optimal to decide not violation. This means that $\min[(1-(p(H_V|e_V)))L_V, p(H_V|e_V))L_{NV}] = p(H_V|e_V)L_{NV}$. In this case, $EG_d(\bar{E}) = 0$. There is no gain obtained by gathering the evidence. The reason is that gathering evidence does not affect the decision. Even if e_V shows up, it still minimizes expected loss to decide not violation. The expected loss of our decision ex post will be less if e_{NV} shows up, and greater ex post if e_V shows up. Before we know the outcome of the evidence, we face the same expected loss as the expected loss of not gathering \bar{E} . Simply put, we cannot expect to reduce expected losses of errors by gathering the evidence.

³⁹² Readers familiar with information theory should note similarity between measuring the decision value of evidence and the information theoretic value of information, which is the expected reduction in entropy. Expected reduction in entropy can be seen as a special case of the decision value of evidence.

Now, assume that if e_V shows up, it is optimal to decide violation. This means that $\min[(1-(p(H_V|e_V))L_V, p(H_V|e_V)L_{NV})=(1-(p(H_V|e_V))L_V$ since $(1-(p(H_V|e_V))L_V < p(H_V|e_V)L_{NV}$. We then get

$$\begin{aligned} EG_d(\bar{E}) &= \\ p(H_V|e_V)p(e_V)L_{NV} - (1-(p(H_V|e_V))L_V)p(e_V) &= \\ p(e_V)[p(H_V|e_V)L_{NV} - (1-(p(H_V|e_V))L_V)]. \end{aligned}$$

The value of $EG_d(\bar{E})$ will be positive since $(1-(p(H_V|e_V))L_V < p(H_V|e_V)L_{NV}$. Thus, if gathering evidence makes it optimal to change decision for some outcomes of evidence, it has positive decision value. This decision value will increase with the higher $p(e_V)$, the higher $p(H_V|e_V)$, the higher L_{NV} , and the lower L_V . Thus, the decision value of evidence is higher, the higher the chance we will gather some evidence that will change the decision, the higher probative force we are right in changing our decision, the higher the error loss associated with the decision we are changing away from, and the less the error loss is associated with the new decision. Another way to say this is that the higher the chance some new evidence will make it rational to change the decision and the lower the expected loss of this new decision compared to the old decision, the higher is the decision value of evidence. Thus, the last part of the statement in Beckner and Salop (1999): “*The court first should gather information that is least expensive, resolves the most uncertainty, and is most likely to affect its decision*” should now be clear.

If the evidence has no impact on the decision, then it has zero decision value. However, if some outcome of gathering evidence makes it rational to change the a priori decision, the decision value is positive. Thus, the decision value of gathering evidence is always positive.³⁹³ What prevent us from gathering all potential evidence is obviously the costs associated with such efforts. The costs associated with gathering evidence are returned to just below.

5.2.6 Minimizing costs

Probative force, decision value, and costs

Above, the probative force of evidence, the decision value of evidence, and how the probative force is related to decision value were addressed. Now it is time to address the cost side of

³⁹³ Raiffa and Schlaifer (1961) show that this is a general result.

evidence. Evidence gathered might have probative force and have a decision value by reducing the expected error loss of the decision, but there is also a cost associated with gathering evidence. Thus, there is a tradeoff between decision value of evidence and the cost associated with gathering the evidence. Minimizing the sum of the expected losses from errors of a wrongful decision and the costs associated with gathering evidence is the ultimate goal of evidence gathering in a decision theoretic context. In this subchapter the cost side of gathering evidence is discussed, while the tradeoff between decision value and cost will be returned to in the next subchapter.

The costs of gathering evidence

The general economic concept of costs applies to the costs of gathering of evidence. This means that the cost of gathering \bar{E} is the alternative value of the resources used to gather \bar{E} . The cost of gathering evidence involves labor that could be used elsewhere and the use of other inputs that could have been used elsewhere. Gathering the evidence includes the time to search for and collect “raw” evidence, for instance, market data, and to process and assess these data, for instance, by performing an econometric analysis. The costs are incurred by the parties in the case, which include enforcement authorities in case of public enforcement, and the courts. Costs may also be incurred by others, for instance, the third parties asked to give information and to provide witness testimony.³⁹⁴ If costs are incurred by enforcement authorities with resource constraints, the alternative value of gathering evidence is using the resources on other cases. All costs should be taken into account by a rational decision maker. In practice, a decision maker is likely to minimize his own costs and not the overall social costs. This topic is returned to in the study of actual assessment of evidence in antitrust below.

Cost minimization and presumptions

The person with the lowest cost in gathering some specific evidence should be the person that gathers it. Analytically, we can split the cost function and evidence collected into separate cost functions associated with the parties involved. For instance, we can let $\bar{E} = \{\bar{E}_P, \bar{E}_D\}$. \bar{E}_P is the evidence gathered by the plaintiff and \bar{E}_D is the evidence gathered by the defendant. We can then write $c(\bar{E}) = c^P(\bar{E}_P) + c^D(\bar{E}_D)$. This means that the total gathering costs are the cost associated with the evidence gathered by the plaintiff plus the cost associated with the

³⁹⁴ The parties may pay expert witnesses, but fact witnesses are usually not fully compensated for their time. See Friedman and Kontorovich (2011) for an economic analysis of fact witness payment.

evidence gathered by the defendant. Minimizing cost requires that if evidence \bar{E} is gathered it should be divided in to \bar{E}_P and \bar{E}_D such that cost is minimized.

Presumptions that switch the burden of proof only make sense where there is a competition between parties with conflicting interests in the outcome of the evidence assessment. The correct use of presumptions will generally motivate the one who has the lowest cost in gathering evidence to actually do so. This means that the facts would be presumed “against” the person who can refute the presumption at the lowest cost. In antitrust the public enforcers will typically be better informed on the general tendency of certain conduct to have anti-competitive effects and the methods suitable to calculate the economic welfare. These enforcers can typically also more cheaply gather necessary information from third parties, both because of enforcement powers and because those third parties might be less hesitant to provide public authorities with information than to provide it to trade partners who might commercially exploit the information.³⁹⁵ Typically, persons will be able to provide their private information at lower cost. It is, for instance, easier for parties to provide evidence concerning their own production costs and profit margins.

The incentives must be properly taken into account when assessing the cost performance of presumptions. A general principle in the game theoretical analysis of evidence assessment is that a presumption to the disadvantage of one person will give the person the incentive to provide the information.³⁹⁶ If we assume that it is sufficient more costly to provide fabricated evidence than to provide real evidence, this means that the person will provide the real evidence if it exists, and else not.³⁹⁷ Then, it is possible to make inferences from the failure to present evidence. This is central in game theoretical models of evidence assessment. We will get back to game theoretical models of evidence assessment below.

The frequency of certain defenses should also be taken into account in the determination of presumptions.³⁹⁸ This can be illustrated by the failing firm defense used in merger control. This defense is briefly described as the defense that a merger will not have anticompetitive effect because the firm acquired is on the edge of failing. Assume that this situation has relevance in only one percent of merger cases. If the plaintiff had the burden to proof in every case that the acquired firm was not a failing firm, this would likely represent a

³⁹⁵ It is assumed that the enforcement authorities can use the information without revealing commercially valuable information.

³⁹⁶ See Milgrom and Roberts (1986) for an early game theoretical model. Game theoretical models of evidence assessment will be discussed in the subchapter on economic models of actual evidence assessment below.

³⁹⁷ See Sanchirico (2012). See also Posner (1999) and Posner (2011) p. 823.

³⁹⁸ See Posner (1999) and Posner (2011) p. 826.

waste of resources compared to the situation where the acquiring firm has to prove that the conditions for the failing firm defense are present in the actual situation.

As noted above, the initial presumptions for anticompetitive effects in the presumption rules established in the US and EU are based on the confidence in anticompetitive effects and not explicitly on cost considerations. However, cost consideration should also rationally play a role in the determination of the presumption rules. This was discussed in detail in Chapter Four. However, it is clear that many of the presumptions established in the application of antitrust rules such as the failing firm defense in merger control at least have cost justifications. The same applies to the efficiency defense in general, where those who allege efficiencies to justify their conduct generally have the burden of proof regarding these efficiencies. The actual allocation of costs in antitrust evidence assessment will be discussed in more detail in the discussion of actual evidence assessment in antitrust below.

Procedural rules and cost of evidence gathering

The procedural rules in general have a strong impact on the cost of gathering evidence. Rules on disclosure and out of court settlements can impact the cost of producing evidence.³⁹⁹ Voluntarily disclosure of evidence is normally less costly than some forced disclosure of evidence, or by gathering the evidence by force using investigative powers. Procedural rules can create proper incentives for cheap disclosure of evidence. The study of the impact on procedural rules on litigation costs is a central branch of law and economics.⁴⁰⁰ It should be mentioned that leniency programs in antitrust enforcement have received much attention by economists. A leniency program means that a co-conspirator who provides new evidence necessary to convict the other conspirators can receive full amnesty or have their sanctions reduced. Leniency is, inter alia, an instrument for enforcement authorities to gather evidence at low costs.⁴⁰¹ The impact of procedural rules on evidence assessment will be returned to in the modeling of actual evidence assessment below.

5.2.7 Decision value, evidence costs, and rational evidence gathering

Combining decision value and evidence costs to minimize total costs

Above the concept of probative force was discussed. This is a central input in finding the decision value of evidence, which was discussed next. Then, the costs associated with

³⁹⁹ See Posner (2011) p. 826.

⁴⁰⁰ See for instance Spier (2007) for a survey of this literature.

⁴⁰¹ See for instance Harrington (2008a, 2008b) and Spagnolo (2008).

gathering evidence, including the use of presumptions and other instruments to minimize the costs were discussed. Now, it is time to combine these measures and analyze the tradeoff between the decision value of gathering evidence and the costs associated with gathering evidence. By doing so, the total costs consisting of the expected losses from errors and the cost of gathering evidence can be minimized.

Decision trees

A decision tree is a useful analytical tool to analyze the optimal gathering of evidence. Decision trees are a central tool in statistical decision theory, which studies the optimal sequential gathering of data and optimal stopping rules.⁴⁰² Kerber et al. (2008) and Kretschmer (2011b) use decision trees to study optimal sequential investigation rules in an antitrust context. Kerber et al. (2008) and Kretschmer (2011c) study the abandonment of the per se violation in the US following *Leegin*⁴⁰³ in a decision theoretic context of sequential evidence gathering. These studies share some similarities with the analysis presented here.

To keep the analysis simple, it is assumed that the total potential amount of evidence consists of two elements of evidence that can be gathered. This means that $\bar{E}^{\text{Tot}} = \{\bar{E}_1, \bar{E}_2\}$. Furthermore, it is assumed that gathering \bar{E}_1 has two potential outcomes (e_{11}, e_{12}) with probabilities $p(e_{11})$ and $p(e_{12})$. We can, for instance, assume that there are two potential elements of evidence to prove a price conspiracy, which is whether there has been parallel conduct (\bar{E}_1 has outcome e_{11}) or not (\bar{E}_1 has outcome e_{12}) and whether there has been exchange of information between the alleged parties to the conspiracy (\bar{E}_2 has outcome e_{21}) or not (\bar{E}_2 has outcome e_{22}). This is, of course, a drastic simplification; nevertheless, it illustrates the point.

The costs are assumed to be zero if no evidence is gathered, $c(\bar{E}_1)$ if only \bar{E}_1 is gathered, $c(\bar{E}_2)$ if only \bar{E}_2 is gathered, and $c(\bar{E}_1, \bar{E}_2)$ if both \bar{E}_1 and \bar{E}_2 are gathered.⁴⁰⁴

The decision maker can choose to gather either \bar{E}_1 or \bar{E}_2 first or to not gather any evidence. If \bar{E}_1 or \bar{E}_2 is gathered first, the decision maker can choose to gather the one of \bar{E}_1 or \bar{E}_2 that was not gathered first or to not gather more evidence. In the decision tree, gathering \bar{E}_2 first is modeled as deciding to not gather \bar{E}_1 first, then deciding to gather \bar{E}_2 , and then eventually gathering \bar{E}_1 after that. This is better understood by inspecting the decision tree

⁴⁰² See for instance Parmigiani and Inoue (2009) p. 221 f.

⁴⁰³ *Leegin Creative Leather Prods, Inc. v. PSKS, Inc.*, 551 US 877 (2007).

⁴⁰⁴ A careful reader will reveal that quite strong assumptions are imposed regarding the costs. It is assumed that there might be some economies or diseconomies of scale or scope in the gathering of evidence as we might have $c(\bar{E}_1, \bar{E}_2) > c(\bar{E}_1) + c(\bar{E}_2)$ or $c(\bar{E}_1, \bar{E}_2) < c(\bar{E}_1) + c(\bar{E}_2)$. However, it is assumed that the cost of gathering both \bar{E}_1 and \bar{E}_2 is not dependent on the sequence they are collected (or if they are collected both at once).

presented in Figure 5.1 below. In the decision tree, squares represent decision nodes, circles chance nodes and triangles are end nodes in correspondence with the normal convention.

The expected loss from error plus the cost of gathering evidence is listed at each end node. The optimal gathering of evidence is solved by backward induction. This means that we start at the end nodes and derive the expected loss and cost of a decision at the decision node before that level and move “backwards” in the tree. In the decision node before the top end nodes in the decision tree \bar{E}_1 is gathered with outcome e_{11} . If we choose to gather \bar{E}_2 , our expected loss and costs will be $EL(e_{11}, \bar{E}_2) + c(\bar{E}_1, \bar{E}_2)$, which is calculated as

$$EL(e_{11}, \bar{E}_2) + c(\bar{E}_1, \bar{E}_2) = (EL(e_{11}, e_{21}) + c(\bar{E}_1, \bar{E}_2))p(e_{21}) + (EL(e_{11}, e_{22}) + c(\bar{E}_1, \bar{E}_2))p(e_{22}).$$

If we choose to not gather \bar{E}_2 , our expected loss and cost will be $EL(e_{11}) + c(\bar{E}_1)$. In this situation, it will be rational to gather \bar{E}_2 if $EL(e_{11}, \bar{E}_2) + c(\bar{E}_1, \bar{E}_2) < EL(e_{11}) + c(\bar{E}_1)$. If this is the case, we draw a thick line, as illustrated in Figure 5.1. The expected loss and costs under these conditions is then $EL(e_{11}, \bar{E}_2) + c(\bar{E}_1, \bar{E}_2)$. The same can be done if \bar{E}_1 is gathered with outcome e_{12} . In Figure 5.1, it is assumed if e_{12} is observed it is not rational to gather \bar{E}_2 . This is because it is assumed that $EL(e_{12}) + c(\bar{E}_1) < EL(e_{12}, \bar{E}_2) + c(\bar{E}_1, \bar{E}_2)$. The expected cost and loss will be less by not gathering \bar{E}_2 . The expected loss if e_{12} is observed is then $EL(e_{12}) + c(\bar{E}_1)$.

We can now move one step backward in the decision three. If we gather \bar{E}_1 , e_{11} is observed with probability $p(e_{11})$ and e_{12} is observed with probability $p(e_{12})$. The expected loss of gathering \bar{E}_1 first is then given by

$$(EL(e_{11}, \bar{E}_2) + c(\bar{E}_1, \bar{E}_2))p(e_{11}) + (EL(e_{12}) + c(\bar{E}_1))p(e_{12}).$$

The same analysis can be performed for the other end nodes in the decision tree. If \bar{E}_2 is gathered first and if the outcome is e_{21} , then it is assumed that it will be rational to gather \bar{E}_1 with expected loss and cost $EL(\bar{E}_1, e_{21}) + c(\bar{E}_1, \bar{E}_2)$. However, if the outcome is e_{22} , then it is assumed that expected loss and cost will be less by not gathering \bar{E}_1 , so it is rational to not gather \bar{E}_1 . The expected loss will then be $EL(e_{22}) + c(\bar{E}_2)$. If we gather \bar{E}_2 , e_{21} is observed with probability $p(e_{21})$, and e_{22} is observed with probability $p(e_{22})$. The expected loss of gathering \bar{E}_2 first is then given by

$$(EL(\bar{E}_1, e_{21}) + c(\bar{E}_1, \bar{E}_2))p(e_{21}) + (EL(e_{22}) + c(\bar{E}_2))p(e_{22}).$$

If we not start gathering \bar{E}_2 after deciding to not gather \bar{E}_1 first, the expected loss and cost (there will be no cost as no evidence is gathered) is EL. In Figure 5.1 it is assumed that gathering \bar{E}_2 after deciding to not gather \bar{E}_1 has less expected loss and cost than not gathering \bar{E}_2 , which means that

$$(EL(\bar{E}_1, e_{21}) + c(\bar{E}_1, \bar{E}_2))p(e_{21}) + (EL(e_{22}) + c(\bar{E}_2))p(e_{22}) < EL.$$

Now we are back at the start node. The thick line at \bar{E}_1 means that it is assumed that deciding to gather \bar{E}_1 first has lower expected loss and cost than deciding to not gather \bar{E}_1 first (and then, eventually, gathering \bar{E}_2 first). This means it is assumed that

$$(EL(e_{11}, \bar{E}_2) + c(\bar{E}_1, \bar{E}_2))p(e_{11}) + (EL(e_{12}) + c(\bar{E}_1))p(e_{12}) < \\ (EL(\bar{E}_1, e_{21}) + c(\bar{E}_1, \bar{E}_2))p(e_{21}) + (EL(e_{22}) + c(\bar{E}_2))p(e_{22}).$$

Thus, by backward induction we have figured out that the optimal sequential decision is to start by gathering \bar{E}_1 . If e_{11} is the outcome, we should gather \bar{E}_2 . However, if e_{12} is the outcome from gathering \bar{E}_1 , we should decide on the basis of e_{12} , and not incur the cost of gathering \bar{E}_2 .

We can see that at each decision node it is rational to gather more evidence if the decision value of evidence exceeds the extra costs. Assume, for instance, that we are in the top of the tree. Given that we have gathered \bar{E}_1 and the outcome turn out to be e_{11} , it was shown above that it was optimal to gather \bar{E}_2 if $EL(e_{11}, \bar{E}_2) + c(\bar{E}_1, \bar{E}_2) < EL(e_{11}) + c(\bar{E}_1)$. This means that it is rational to gather evidence if $EL(e_{11}) - EL(e_{11}, \bar{E}_2) > c(\bar{E}_1, \bar{E}_2) - c(\bar{E}_1)$. This can be written as $EG_d(\bar{E}_2|e_{11}) > c(\bar{E}_1, \bar{E}_2) - c(\bar{E}_1)$. Thus, it is optimal to gather more evidence if the decision value exceeds the additional cost.

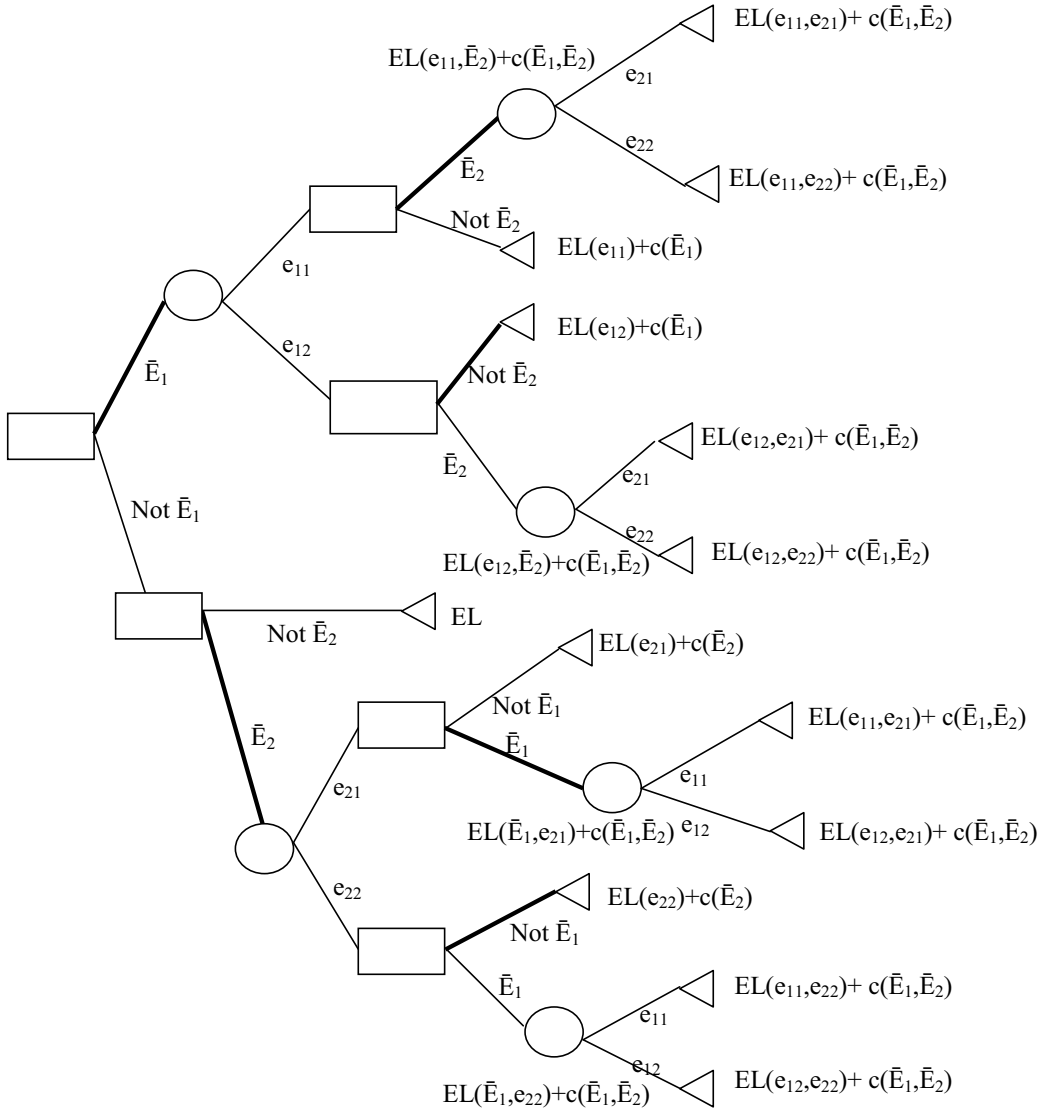
Backward induction is the use of dynamic programming to solve sequential decisions. It is easy to see that this task soon becomes extremely complex. Let us say that we extend the potential evidence to 10 elements, which means $\bar{E}_T = \{\bar{E}_1, \dots, \bar{E}_{10}\}$. Furthermore, assume that each element can have three or more outcomes. The amount of computations might be prohibitive for deriving the optimal sequential decision tree in those situations. It might even be irrational if the cost of such computations is weighed against the performance of cheaper methods. The question is how good alternative methods are. Various methods developed for, inter alia, artificial intelligence, can provide guidance. Methods of path-finding provide

heuristics for forward induction methods that require fewer computations than backward induction.⁴⁰⁵ An easy heuristic method that might perform well is to first look for the evidence, \bar{E}_i , with the highest difference between the decision value and cost. Then, depending on the \bar{E}_i , do the same operation conditionally on this outcome and repeat this process until there is no more evidence where the decision value exceeds additional costs.

Heuristic methods provide some guidance. However, as will be explored further below, legal evidence assessment is much about the use of human intuition and experience assessing evidence holistically based on informal methods of practical reasoning. The evidence gathering process can be supported by a competition between parties with opposing interests in the decision in providing the evidence. The challenge is then to create practical assessment principles and procedures that facilitate as rational an evidence assessment as possible.

⁴⁰⁵ See Millington (2006) p. 203 f. See Kretchmer (2011b) for an antitrust related discussion.

Figure 5.1: decision tree for optimal sequential evidence decisions



Optimal evidence gathering in antitrust

When assessing evidence in antitrust analysis the question is whether the antitrust assessment principles and procedures facilitate the optimal gathering of evidence. The presumption rules represent the initial stage of antitrust analysis. The presumption rules are based on the confidence in the anticompetitive effects of the conduct in question in general. The need to scrutinize the actual circumstances of the case is dependent on the strength of this confidence. From a decision theoretic point of view, more considerations should be taken into account in the determination of the presumption rules. The losses from a wrongful decision should also be taken into account to assess the decision value of gathering more evidence. Furthermore, the costs of gathering evidence should be taken into account, as mentioned above. This corresponds to the conclusions drawn in Chapter Four.

The presumption rules apply to the initial assessment of the case. The antitrust assessment principles and procedure should facilitate a rational evidence assessment throughout the whole case. If the initial presumption is refuted, this might establish a new rational presumption that might be refuted, and so on. In this way the burden of proof should shift optimally back and forth between the parties. Throughout the process, the inferences based on the evidence should be rational.

An obvious observation that can be made is the different possibility to implement rational evidence gathering in inquisitorial systems, like the enforcement of the EU Commission, and in adversarial systems like that of the US. In an inquisitorial system, the inquisitor could, in theory, implement rational evidence assessment by moving along the decision tree throughout the decision making process. In an adversarial process, the decision makers have less control over the cost-efficiency of evidence gathering. The courts can, through precedence, establish presumption principles that facilitate rationality in the production of evidence. The courts also have some opportunities for sequential decisions, such as handling motions to dismiss a case, deciding the applicability of summary judgments and in making judgments as a matter of law. Furthermore, the decision maker can exercise some control throughout the process by enforcing the rules of admissible evidence. According to the Federal Rules of Evidence, Rule 403,

[t]he court may exclude relevant evidence if its probative value is substantially outweighed by [...] undue delay, wasting time, or needlessly presenting cumulative evidence.

Thus, the courts can declare some evidence inadmissible as needless, and by this, either end the process or shift the burden to the other party to refute the inferences from the evidence already gathered.

The question of whether the decision makers actually will implement a rational evidence assessment depends on various factors, including the incentives of the decision makers, the assessment abilities of the decision makers, and the incentives of the parties involved to provide evidence. The ability for the actual assessment principles and procedures used in antitrust to facilitate rational evidence assessment will be discussed further below.

5.2.8 Rational versus actual evidence assessment in antitrust

After having described the framework of rational evidence assessment, the next question becomes how to assess the performance of actual evidence assessment against the rational evidence assessment standard. This is a more difficult task than assessing the rationality of legal rules. While there at least might be some degree of clarity on what rule an antitrust decision maker has applied in a specific case, the evidence assessment is less transparent. In jury trials, the evidence assessment is only in the mind of the jurors. We can only infer the evidence assessment from the conclusions made by the jury. In decisions where the grounds include evidence assessment, we can see what evidence has been relevance for the decision, and some of the inferences drawn from the specific pieces of evidence. We will however seldom see explicit probability assessments in terms of updating according Bayes' rule, probability ratios, decision values, and so on, in an antitrust decision, except possibly in the use of statistical and econometrical analyses. We will, however, observe vaguer statements such as that it is established that the evidence is consistent and reliable in favor of violation, that there are no other plausible explanations for the conduct in question other than to restrict competition and so on. The actual formulation of such statements by the decision makers below will be returned to below. Thus, much of the information on how the evidence is actually assessed is in the mind of the decision makers. The decision maker themselves may rely on non-quantifiable measures such as intuition, experience, and practical principles that will be described further below.

In the remainder of this chapter, actual evidence assessment in antitrust is studied. Several theories are relied on in the study of how antitrust decision makers actually assess evidence. There is an extensive interdisciplinary body of literature addressing the actual assessment of legal evidence and its performance. This includes contributions from

philosophy and psychology, as well as economics, which enlighten various aspects of evidence assessment. Some of this literature addresses antitrust evidence assessment specifically. This literature also provides important insights as to why actual evidence assessment may deviate from rational evidence assessment.

In the tradition of law and economics, economic models are used to study actual legal evidence assessment. Game theory is used to study the strategic interaction between optimizing players involved in the evidence assessment, including the parties and the decision makers. By making suitable assumptions, holistic models of evidence assessment can provide additional insight to the interdisciplinary studies mentioned above. The benefit of models is that they can be used to analyze dynamical elements of antitrust assessment and to derive equilibrium outcomes that can be compared to the rational outcome. By basing a model on the same framework as the framework used to guide rational evidence assessment above, the model will be particularly informative in comparing how actual evidence assessment is likely to correspond with rational evidence assessment. Thus, this chapter will also include economic modeling of evidence assessment to study the performance of evidence assessment in antitrust.

5.3 Actual evidence assessment in antitrust

5.3.1 The framework for actual antitrust evidence assessment

At a superior level, some fundamental principles must be in place for the procedure surrounding legal evidence assessment to work as a truth seeking process and not some instrument for abusing power. A trial that accurately and efficiently resolves civil disputes and that safeguards the rights of the defendant in the pursuit of a correct judgment in criminal cases, are often stated as main goals of legal procedure in civilized legal systems.⁴⁰⁶ The trial must be fair to promote these goals.⁴⁰⁷ A fair trial must facilitate an assessment of evidence in line with these ideals. This includes important rights such as contradictory rights, presumption of innocence in criminal cases, and a right to appeal. Competence requirements promote the

⁴⁰⁶ See inter alia Posner (1999) and Posner (2011) p. 757 f.

⁴⁰⁷ In criminal cases the term “fair trial” is often used as a term for a trial that safeguards the rights of defendants in criminal procedure. The term “fair trial” is used in the European Convention of Human Rights article 6 and is give content by the European Court of Human Rights. Many of the rights necessary for a fair trial are included in the constitutions of EU member states and in US. Note that whether a trial is criminal or not according the European Convention on Human Rights is functional and not determined by the formal national classification. This means that the enforcement of European Commission involving fines is criminal according to the convention.

independence of judges and jurors by disqualifying judges or jurors who have direct personal interests in the outcome of the case.

A procedure that is not fair is often referred to as a witch-hunt. A witch-hunt is characterized by pre-judgments and presumptions (for instance, presumption of guilt) that are difficult to refute if even possible.⁴⁰⁸ Furthermore, a witch-hunt might be characterized by methods of evidence assessment not based on logic, knowledge, and science. An example of this would be to make inferences of guilt from irrelevant evidence such as the weather of the day the case is decided or who paid the judge most in bribes.⁴⁰⁹

In most developed countries, the legal procedure can, overall, be characterized as a “fair trial”, even supreme courts and supranational courts such as the European Court of Human Rights occasionally find violations even in the most developed countries. There have been some critics against fairness of the inquisitorial antitrust enforcement in EU.⁴¹⁰ When the authorities act as investigator, prosecutor, and decision maker, it might be subject to biased preferences towards finding a violation. There has even been a discussion as to whether the current system complies with the European Convention of Human rights.⁴¹¹ As described in Chapter Two there have been some reforms in the EU addressing some of the critique against the EU decision procedures. Substantive antitrust law can also be criticized to operate with strong presumptions of anticompetitive effects that are almost impossible to refute.

For the present purposes, it is assumed that the trial is fair at a general level. Thus it will not be explicitly discussed how antitrust evidence assessment might be affected by bribes, that the decision maker has direct personal economic interest in the outcome of the case for one of the parties, or other major irregularities. Note, however, that this is not to say that bribes and similar irregularities are non-existing in antitrust cases.

As described in Chapter Two, the superior principles of legal procedure can be divided into two main principles: the inquisitorial system and the adversarial system. It is also possible to speak of degree of inquisition, assuming a sliding scale between the adversarial and inquisitorial procedure.⁴¹² The organization of procedure is an important premise for the evidence assessment.

⁴⁰⁸ Walton (2001) p. 185-186 states some characteristics of a witch-hunt.

⁴⁰⁹ Or in literal witch hunts; whether the body floats in water or not.

⁴¹⁰ See for instance Wils (2004), Geradin (2010) and OECD (2010).

⁴¹¹ See Wils (2004) and Geradin (2010). It will be beyond the scope of this study to go further into the issue on whether the enforcement system in EU complies with the European Convention on Human Rights.

⁴¹² See Parisi (2002). See also Damien (2006).

In the inquisitorial system, the inquisitor has control over what evidence is gathered and the assessment of this evidence. As discussed above and in Chapter Two, the enforcement of the EU competition law by the European Commission can be best be characterized as an inquisitorial system.⁴¹³ Thus, the Commission has, as a starting point, control over what evidence is gathered and the assessment of this gathered evidence. However, contradiction rights and rights to formal hearings secure some adversarial elements in the framework within the inquisitorial system. The party under scrutiny by the inquisitor might try to convince the inquisitor by presenting his own evidence and argue for his own assessment of the evidence gathered. Compared to an adversarial system, the power balance is asymmetric in the inquisitorial system. It is the inquisitor that makes the decision. The decision of the European Commission can be brought to the European courts, following an adversarial system. Thus, the system is not purely inquisitorial. The system including judicial review can be described as a mixed system.⁴¹⁴ However, the system in the EU will not be the same as one following an adversarial system from start. As described in Chapter Two, there are limits on the courts' competence to challenge the evidence assessment in the judicial review. The court can only challenge manifest errors in the assessment of complex economic evidence and cannot replace an economic analysis with its own. Furthermore, there is a substantial difference between being the defendant in an adversarial procedure and being a plaintiff challenging the decision of an inquisitor in the courts. The plaintiff who challenges the inquisitor in courts has the burden to initiate litigation and the initial burden to establish the presence of errors in the decision of the inquisitor.

In contrast to the EU, US antitrust cases mainly follow the adversarial system, as described in Chapter Two. Even if the enforcement by the FTC is administrative, the procedure is adversarial. An additional main difference between the US and EU is the use of juries to assess evidence in US as a main rule.⁴¹⁵ In jury trials, the judge determines the law and serves as a gatekeeper of the jury's access of evidence by enforcing the rules of evidence. In the adversarial process it is the opposing parties that have the responsibility to gather evidence to support their case, and the judge has limited control on what evidence will be

⁴¹³ The member states may have implemented a more or less adversarial system in their enforcement of EU competition rules. Many countries do, however, operate with an enforcement system similar to the enforcement of the European Commission. However, when the EU member states prosecute antitrust offences criminally according to their national jurisdictions, the procedure is adversarial. A comparative study of the process in the different European jurisdictions is beyond the scope for this study.

⁴¹⁴ A term used by Posner (2011) p. 852

⁴¹⁵ As it will be described below, there are exceptions to jury trials. Laymen juries are not used in the FTC administrative procedure.

presented in court. The judge can reject some evidence as inadmissible and hereby exercise some negative control on the evidence. Furthermore, the judge also indirectly exercises some control on the amount of evidence by deciding on the time frame of the case. By asking clarifying questions, the judge might also indirectly influence the evidence presented. The judge or jury are normally free to assess the evidence presented, but might be bound by facts on which both parties agree upon.

The procedural issues described above are the paramount principles of procedure. Other procedural rules might also have a big impact on the evidence assessment. Rules on disclosure of evidence, rules on settlements, rules on appeal, and even rules on voting between judges and jurors can have big impacts on the outcome of the evidence assessment. The impacts of various procedural rules are returned to below.

5.3.2 Abductive reasoning and actual evidence assessment

Abductive reasoning

Abductive reasoning⁴¹⁶ has been pointed at by legal philosophers as the method decision makers apply in the actual assessment of legal evidence.⁴¹⁷ Abduction is about finding plausible explanations of evidence in deriving the best explanation. Abductive reasoning is sometimes described as an heuristic and intuitive holistic assessment of evidence.^{418, 419} Heuristic methods of inference to the best explanation are the best we have in the presence of complex evidence and no reliable estimates on probabilities, especially on the compounded probability associated with all evidence. The question is what inference to the best explanation is more precisely is. How do we find the best explanation for some evidence? It has been suggested that the best explanation is the one that provide most understanding of the

⁴¹⁶ The concept of abductive reasoning was first introduced by the philosopher C. S. Pierce. See for instance Pierce (1965).

⁴¹⁷ See Walton (2002) and Walton (2005b). See also Pardo (2010).

⁴¹⁸ See Kolflaath (2007) and Graver (2009).

⁴¹⁹ Note that even if the inference to the best explanation is heuristic and intuitive, this does not mean that more precise principles used in the search for the best explanation is impossible to describe further. In artificial intelligence, the use of heuristic principles to solve decision problems is well established. The mutual exchange of insight between philosophy and artificial intelligence research has provided us with an increased insight on heuristic methods. Methods used in artificial intelligence such as artificial neural networks that mimic the function of the brain, fuzzy logic that is used to make decisions based on fuzzy terms, and cluster methods used to categorize observations based on certain characteristics inform heuristic reasoning. See, for instance, Witten and Frank (2005) or Milligton (2006) for technical descriptions of such methods of artificial intelligence. In addition to being informative as to how actual heuristic reasoning work, artificial intelligence provides us with some additional insight. Artificial methods reveal that the methods actually work. Even the best chess players have been beaten by machines. Artificial methods also provide insight as to why heuristic methods sometimes fail, and how they can be improved. Walton (2005b) studies the relationship between methods artificial intelligence and legal reasoning.

evidence.⁴²⁰ This is the explanation we get after rounds of critically asking why do we have this evidence. What is the explanation of this evidence? What are the alternative explanations? Contrastive inference and the use of analogies are important in this context. What is the difference between the evidence we possess and some evidence assessed earlier? Does this evidence calls for another explanation? The use of expert opinion and, in general, to listen to persons in a better position to know, is also an important element in the search for the best explanation. Abductive reasoning is also about utilizing presumptions to find the best default explanation. The best default means that one who asserts that there is some other explanation of the evidence than the default, must present arguments that this other explanation is better. This means that abduction, in principle, is a method of creating presumptions and switching the burden of proof.⁴²¹

Lipton (2004) argues that inference to the best explanation, as a main rule, gives us a correct assessment of evidence corresponding to the assessment obtained by a rational probabilistic approach. Thus, the inference to the best explanation is also the inference to the most likely explanation.⁴²² Lipton (2004) is aware of biases and imperfections that might cause the best explanation to deviate from the most likely explanation of evidence. The impact of these biases on the inference is, however, not the main rule. According to Lipton (2004), we do not perform so poorly in the inference to the best explanation, even though this is done without the explicit use of probability calculus. This is in line with research showing that an intuitive holistic assessment of complex evidence often performs even better than attempts to decompose evidence and to algorithmically address uncertainty, by for instance, Bayesian updating.⁴²³ The argumentation by Lipton (2004) is reasonable. It basically means that evidence assessment is likely to be correct if there are no reasons to believe that the assessment is wrong.

Finding the best explanation of evidence might seem too vague to be a precise description of legal evidence assessment. In legal evidence assessment different standards of proof apply depending on the nature of the case. This was described in Chapter Two. Finding the best explanation of evidence is maybe descriptive for cases where balance of probabilities is the standard of proof. However, when a higher standard of proof is required, finding the best explanation of evidence is not enough. The standard of proof adds some additional

⁴²⁰ See Lipton (2004) p. 59.

⁴²¹ See Walton (2002).

⁴²² See Lipton (2004) p. 107 f.

⁴²³ See Posner (2008) p. 108 f. for a discussion and references to the research on the topic.

requirements to the best explanation. Luckily, the abductive method of finding the best explanation involves assessments that make it possible to assess the goodness of the best explanation. The search for the best explanation involves the search for other plausible explanations in the process. The plausibility of alternative explanations is determining for how good the best explanation is. By assessing the plausibility of alternative explanations, we get an idea on how good the best explanation is. Thus, in assessing evidence according to a qualified standard of proof, the best explanation together with the alternative explanations are determining for whether the standard of proof is satisfied. Thus, inference to the best explanation is suitable in the assessment of evidence according to alternative standards of proof. If, for instance, the standard of proof is beyond reasonable doubt, the question is if there are alternative explanations plausible enough to create reasonable doubt.

Abductive reasoning and antitrust evidence

As abductive reasoning is considered descriptive as the method for the actual assessment of legal evidence, the question becomes whether this is also descriptive of the assessment of antitrust evidence. There are good arguments that it is.

It appears that the chief elements of abductive reasoning, such as the use of presumptions, analogies, and expert knowledge, are all crucial elements of antitrust evidence assessment. As described above, the use of presumption rules that switch the burden of proof is a central element of antitrust decision making. The presumption rules in the US and EU can be interpreted as default inferences in assessing the conduct in question. The anticompetitive explanation is the best default inference we can do. This is established as facts as long as the defendant does not come up with sufficient plausible explanations as to why the conduct in question is pro-competitive or improves welfare in other ways. The question is if these explanations are sufficiently plausible to refute the presumption.

Furthermore, the use of analogies, in terms of how evidence has been assessed in former cases, regularly serves as a benchmark for assessing the evidence in a new case. Expert knowledge, especially economic expert knowledge, is used to aid the decision making.

Thus, at a superior level, abductive reasoning seems to be describable for the assessment of evidence in antitrust both in the EU and US. The actual evidence assessment in each of these systems will be discussed in more detail just below.

More on actual evidence assessment methods in US

In the US, the use of juries complicates the issue of evidence assessment. How juries assess evidence is usually not transparent. Jury instructions reveal that the evidence assessment is based on an overall intuitive assessment of the evidence presented. A typical jury instruction in the US on the assessment of evidence is as follows:

*[y]ou should use your common sense in weighing the evidence. Consider it in light of your everyday experience with people and events, and give it whatever weight you believe it deserves. If your experience tells you that certain evidence reasonably leads to a conclusion, you are free to reach that conclusion.*⁴²⁴

The competition between the parties in providing evidence and the rules on admissible evidence is supposed to make the jury to assess the evidence as accurate and objective as possible. The transparency surrounding the evidence assessment will be relatively weak as the jury's inferences from the various pieces of evidence will not be a part of the judge's written opinion. We can compare the evidence presented with the decision made and make inferences about the inferences. There is, however, some situations where the judges assess evidence, and this evidence assessment become a part of the written decision. This is, inter alia, in motions to dismiss antitrust claims, in summary judgment decisions, and in decisions concerning judgments as a matter of law in jury trials.

According to the Federal Rules of Civil Procedure, Rule 8, the plaintiff must present “a short and plain statement of the claim showing that the pleader is entitled to relief.” Thus, the courts may dismiss a claim that has no evidential merits. This makes it possible for the court to dismiss a case already before the discovery phase. These decisions give us a chance to see how courts assess evidence in motions to dismiss. The Supreme Court has, in the two cases *Bell Atlantic Corp. v. Twombly*⁴²⁵ and *Ashcroft v. Iqbal*,⁴²⁶ established the controversial Twombly/Iqbal “plausibility” standard.⁴²⁷ The *Bell Atlantic* case was an antitrust case regarding a conspiracy to fix prices, while *Iqbal* was a discrimination case. For the pleader to be entitled to a relief, the Supreme Court stated in *Bell Atlantic* that

⁴²⁴ ZF Meritor LLC and Meritor Transmission Corporation v. Eaton Corporation, no. 06-023-SLR (October 7, 2009), United States District Court for the District of Delaware.

⁴²⁵ *Bell Atlantic Corp. v. Twombly* 550 U.S. 544 (2007).

⁴²⁶ *Ashcroft v. Iqbal* 129 S. Ct. 1937 (2009).

⁴²⁷ Pardo (2010).

*we do not require heightened fact pleading of specifics, but only enough facts to state a claim to relief that is plausible on its face. Because the plaintiffs here have not nudged their claims across the line from conceivable to plausible, their complaint must be dismissed.*⁴²⁸

The plaintiffs had not managed to establish an antitrust conspiracy as a plausible explanation of the evidence. We can see the statement in connection with the court's statement that the parallel behavior

*was not suggestive of conspiracy, not if history teaches anything. In a traditionally unregulated industry with low barriers to entry, sparse competition among large firms dominating separate geographical segments of the market could very well signify illegal agreement, but here we have an obvious alternative explanation.*⁴²⁹

This tells us that the courts are looking for the plausible explanations, and here the best explanation of the evidence was so good in favor of an alternative competitive explanation that the claim was dismissed. *Bell Atlantic* is also illustrative of how the courts make inferences from single pieces of evidence. The probative force of parallel conduct for the existence of an agreement was addressed by the court stating that

*[t]he inadequacy of showing parallel conduct or interdependence, without more, mirrors the ambiguity of the behavior: consistent with conspiracy, but just as much in line with a wide swath of rational and competitive business strategy unilaterally prompted by common perceptions of the market. See, e.g., AEI-Brookings Joint Center for Regulatory Studies, Epstein, Motions to Dismiss Antitrust Cases: Separating Fact from Fantasy, Related Publication 06-08, pp. 3-4 (2006) (discussing problem of "false positives" in §1 suits).*⁴³⁰

The court here stated the minimal probative force of parallel conduct in inferring an antitrust conspiracy. This statement also relies on the appeal to expert knowledge, which will be returned to below.

Federal Rules of Civil Procedure, Rule 56, states that

[t]he court shall grant summary judgment if the movant shows that there is no genuine dispute as to any material fact and the movant is entitled to judgment as a matter of law. The court should state on the record the reasons for granting or denying the motion.

⁴²⁸ *Bell Atlantic Corp. v. Twombly* 550 U.S. 544 (2007) at 571

⁴²⁹ *Bell Atlantic Corp. v. Twombly* 550 U.S. 544 (2007) at 567.

⁴³⁰ *Bell Atlantic Corp. v. Twombly* 550 U.S. 544 (2007) at 254.

A summary judgment makes it possible for the court to avoid a jury trial if it considers that the facts are sufficiently established to decide as a matter of law without a jury trial. Summary judgments⁴³¹ are interesting from an evidence assessment perspective. They give an indication of what evidence judges consider sufficient facts to make a decision without a jury trial. The Supreme Court has developed a “reasonable jury” standard.⁴³² The court has established that a moving for summary judgment will be dismissed if a reasonable jury could find in favor for the other party.⁴³³ *Matsushita Electronic Industrial Co. v. Zenith Radio Corp*⁴³⁴ was an antitrust case where Zenith alleged Japanese television manufactures for a conspiracy to fix prices at low level to exclude US producers. The question was whether any reasonable jury could find in favor for Zenith. The Supreme Court stated that

*[i]t follows from these settled principles that if the factual context renders respondents' claim implausible -- if the claim is one that simply makes no economic sense -- respondents must come forward with more persuasive evidence to support their claim than would otherwise be necessary.*⁴³⁵

Thus, similar to motions to dismiss, plausibility of the claim is necessary to avoid summary judgment. The claim must make sense. Thus, the one who wants to avoid summary judgment must come up with a plausible explanation of the evidence that supports his claim. In the context of avoiding summary judgment for the absence of an antitrust conspiracy, the court stated that

*[t]o survive a motion for summary judgment or for a directed verdict, a plaintiff seeking damages for a violation of [Sherman Act] § 1 must present evidence "that tends to exclude the possibility" that the alleged conspirators acted independently. 465 U.S., at 764. Respondents in this case, in other words, must show that the inference of conspiracy is reasonable in light of the competing inferences of independent action or collusive action that could not have harmed respondents.*⁴³⁶

Thus, inferring an antitrust conspiracy must be a reasonable explanation of the evidence relative to independent action as an explanation for the evidence.

⁴³¹ Summary judgments are, as a general rule, not available in criminal trials as a jury trial is a fundamental right for criminal defendants.

⁴³² Pardo (2010).

⁴³³ Pardo (2010).

⁴³⁴ *Matsushita Electronic Industrial Co. v. Zenith Radio Corp.* 475 U.S. 574 (1986).

⁴³⁵ *Matsushita Electronic Industrial Co. v. Zenith Radio Corp.* 475 U.S. 574 (1986) at 587.

⁴³⁶ *Matsushita Electronic Industrial Co. v. Zenith Radio Corp.* 475 U.S. 574 (1986) at 587.

RATIONAL ANTITRUST ANALYSIS

As for motions for dismiss, summary judgments are also informative on the probative force of single pieces of evidence. An example in this case is the court's statement that

*[e]vidence that petitioners conspired to raise prices in Japan provides little, if any, support for respondents' claims: a conspiracy to increase profits in one market does not tend to show a conspiracy to sustain losses in another.*⁴³⁷

Thus, a conspiracy to raise prices in one market had no probative force in inferring a conspiracy to charge predatorily low prices in another market.

Even if the jury trial has started, a party might move for a judgment as a matter of law. If the party succeeds in this, the facts are established and the court can decide the case as a matter of law. Federal Rules of Civil Procedure, Rule 50, states that the court may rule as a matter of law

[i]f a party has been fully heard on an issue during a jury trial and the court finds that a reasonable jury would not have a legally sufficient evidentiary basis to find for the party on that issue.

Thus, the reasonable jury standard applies in judgment as a matter of law in jury trials. The reasonable jury standard in summary judgments and in judgments as a matter of law is interpreted similarly.⁴³⁸

Motions to dismiss antitrust claims, summary judgment, and judgment as a matter of law are similar instruments in different stages of litigation. A motion to dismiss a claim can be applied before the discovery starts, summary judgments can be applied before the jury trial starts, and judgment as a matter of law can be applied during jury trial. All instruments foreclose further gathering of evidence, and the case can be decided forthwith. Thus, the ability of courts to dismiss claims, to make summary judgments, and judgments as a matter of law are instruments that can be used to implement rational sequential decisions in the assessment of evidence. The purpose of these instruments is, inter alia, to achieve procedural efficiency.⁴³⁹ It is debated whether the current standards applied in the use of these instruments succeeds in facilitating an efficient procedure.⁴⁴⁰ It is difficult to answer the question of whether judges will assess evidence correctly by inspecting the formulation of the

⁴³⁷ Matsushita Electronic Industrial Co. v. Zenith Radio Corp. 475 U.S. 574 (1986) at 597.

⁴³⁸ Pardo (2010).

⁴³⁹ Pardo (2010).

⁴⁴⁰ See Pardo (2010) for the debate.

standards alone. What matters is the actual evidence assessment performed by the judges in the application of the standards and whether it is likely that judges are subject to imperfections and biases in their assessment. This is returned to below.

One obvious criticism against the rationality of the current standards is the lack of explicit loss of errors and costs considerations. Whether further evidence should be gathered is dependent on reduced expected losses from making a wrong decision and the costs of becoming better informed. The standards seem to be too narrowly focusing on the possibility of wrong decisions and focusing too little on the costs and consequences of wrong decisions. However, loss of errors considerations are partially taken into account by the standard of proof as both the plausibility standard and the reasonable jury standard account for the standard of proof.⁴⁴¹

The discussion of motions to dismiss antitrust claims, summary judgment, and judgment as a matter of law was related to civil procedure. The possibilities to foreclose a jury trial are limited under criminal procedure as the right to a jury trial in the determination of criminal liability is a fundamental right. However, there are some instruments. The court may use the Federal Rules of Criminal Procedure, Rule 12, to decide on issues pretrial, such as motions to suppress evidence. Furthermore, the courts may use the Federal Rules of Criminal Procedure, Rule 48, to dismiss a complaint.

In both civil and criminal litigation, the court may use Federal Rules of Evidence, Rule 403, to declare evidence inadmissible according to efficiency considerations. Thus, the courts have an opportunity to pursue rationality not only in the procedural stages presented above, but also when it comes to the presentation of single elements of evidence.

It should also be noted that the prioritization process internally in the enforcement authorities in the case of public enforcement also involves a screening of cases. The authorities have limited resources that must be prioritized among cases. This means that, if the authorities only pursue the most merit cases, there is less chance that cases associated with weak evidence to arrive trial. However, it may not always be so. The question for enforcement authorities is not necessarily the weakness of evidence in supporting a violation, but whether it will be able to convince juries exploiting cognitive biases and other imperfections in evidence assessment. This topic is returned to below.

In the administrative enforcement of the FTC, it is the administrative law judge that assesses the evidence after an adversarial procedure, and the assessment is finally

⁴⁴¹ Pardo (2010).

administratively decided by the Commission. Thus, on the contrary to jury trials, a FTC decision will contain evidence assessment. Note that the decision of the FTC may be challenged by the courts subject to a limited standard of review. This was described in Chapter Two as the substantial evidence standard. Under this standard, the FTC's finding of facts will be upheld if it is supported by "*such relevant evidence as a reasonable mind might accept as adequate to support a conclusion.*"⁴⁴² Thus, a holistic overall assessment also applies when the FTC evidence assessment is challenged.

More on actual evidence assessment methods in EU

In the EU competition law, the assessment of evidence is more transparent as it is performed by the Commission as a decision maker and by the judges in the courts in case of judicial review. Note, however, that the courts have some limits in challenging complex economic evidence and replacing economic analyses with their own, as described in Chapter Two.

The decision makers can describe how they assess evidence in their decisions. Both the Commission and the courts state the inferences made from the various elements of evidence in the decision. The decision makers may, for instance, state whether an e-mail correspondence have probative force in inferring and agreement or which economic theory is used to infer that some exchange of information has anticompetitive effects.⁴⁴³

When it comes to the methods of accessing the total body of evidence by a statement by Alexander Italianer, Director General of the Directorate for Competition in the European Commission, is illustrative. Italianer stated that "[w]e take into account quantitative and qualitative information to put together a coherent story."⁴⁴⁴ Thus, evidence assessment is about creating a holistic coherent story. This is in line with inference to the best explanation. Furthermore, some statements from the courts are clarifying on the assessment of evidence. In *Aalborg Portland*, the ECJ stated that

*In most cases, the existence of an anti-competitive practice or agreement must be inferred from a number of coincidences and indicia which, taken together, may, in the absence of another plausible explanation, constitute evidence of an infringement of the competition rules.*⁴⁴⁵

⁴⁴² California Dental Ass'n v. FTC, 128 F.3d 720 (9th Cir. 1997) at 725.

⁴⁴³ See, for instance, Joined Cases C-204/00 P, C-205/00 P, C-211/00 P, C-213/00 P, C-217/00 P and C-219/00 P, *Aalborg Portland and Others v. European Commission* [2004] para. 135 f. for a lengthy assessment of the probative force of documents in inferring an agreement.

⁴⁴⁴ Alexander Italianer, "Quantity" and "quality" in economic assessments, Charles River Associates Annual Conference 7 December 2011, Brussels.

⁴⁴⁵ Joined Cases C-204/00 P, C-205/00 P, C-211/00 P, C-213/00 P, C-217/00 P and C-219/00 P, *Aalborg Portland and Others v. European Commission* [2004] para. 57.

If there are no other plausible explanations for some evidence, we are left with a strong best explanation. Recall that the standard of proof used in the EU is also quite illustrative as to how evidence should actually be assessed. In *Microsoft* the court stated that

*The Community Courts must not only establish whether the evidence put forward is factually accurate, reliable and consistent but must also determine whether that evidence contains all the relevant data that must be taken into consideration in appraising a complex situation and whether it is capable of substantiating the conclusions drawn from it (see, to that effect, concerning merger control, Case C-12/03 P Commission v Tetra Laval [2005] ECR I-987, paragraph 39).*⁴⁴⁶

The inquisitional nature of the enforcement by the European Competition makes it possible to implement sequential decision making. Both Regulation 1/2003,⁴⁴⁷ which regulates the procedure in the enforcement of TFEU Articles 101 and 102, and the Merger Regulation,⁴⁴⁸ involve formal stages and phases of the procedure that gives the Commission opportunities to either proceed with the case or abandon the case on the basis of the present evidence. The Commission has also developed best practices that facilitate the enlightenment of the case as it proceeds. This includes best practices in the application of TFEU Articles 101 and 102,⁴⁴⁹ Best practices on merger control proceedings,⁴⁵⁰ and best practices on the submission of economic evidence.⁴⁵¹ Thus, the framework for a rational evidence assessment is in place, which, at least in theory, makes the inquisitorial enforcement in the EU a possible instrument for rational decision making. By implementing the principles in the regulation and best practices, the European Commission should, in principle, be informed to take qualified decisions at the various stages of the process, either on what evidence to gather next or to abandon the case. Furthermore, the Commission can also take the costs into account in weighing the decision value of gathering additional evidence against the costs. The question then becomes whether the Commission is subject to imperfections and biases that make it likely that it will not rationally assess evidence. Such imperfections are returned to below.

⁴⁴⁶ Microsoft Corp v. Commission, Case T-201/04, CFI, 2007 para. 89.

⁴⁴⁷ Council Regulation (EC) No 1/2003 of 16 December 2002 on the implementation of the rules on competition laid down in Articles 81 and 82 of the Treaty Official Journal L 1, 04.01.2003, p.1-25.

⁴⁴⁸ Council Regulation (EC) No 139/2004 of 20 January 2004 on the control of concentrations between undertakings (the EC Merger Regulation) Official Journal L 24, 29.01.2004, p. 1-22.

⁴⁴⁹ Commission notice on best practices for the conduct of proceedings concerning Articles 101 and 102 TFEU 2011/C 308/06.

⁴⁵⁰ DG Competition Best Practices on the conduct of EC merger control proceedings 20. January 2004.

⁴⁵¹ DG Competition, Best Practices For The Submission of Economic Evidence and Data Collection in Cases Concerning the Application of Articles 101 And 102 TFEU and in Merger Cases, Staff Working Paper.

The way to proceed

The discussion above has established that abductive reasoning, which is the search for plausible explanations of evidence to reach a best explanation, is descriptive for the antitrust decision makers' actual assessment of evidence. The assumption of Lipton (2004), as described above, is that inference to the best explanation as a starting point yields a correct assessment of evidence unless the decision makers are subject to imperfections and biases. This seems to be a reasonable starting point. Furthermore, both the US and EU procedural frameworks contain elements that, in theory, can facilitate rational sequential decision making.

With this starting point, the next step becomes to identify the sources of imperfections and biases in actual antitrust evidence assessment and assess how they are likely to affect the outcome. In the remainder of this subchapter, various sources of imperfections and biases in antitrust evidence assessment are identified. These include institutional biases, cognitive biases, imperfections in the use of analogies, imperfections associated with the appeal to expert knowledge, and how the abuse of rhetoric may distort the evidence assessment. The impact of these imperfections and biases will provide information as to whether actual evidence assessment is likely to deviate from rational evidence assessment. After this discussion, this insight is used in the next subchapter as input in an economic model of actual evidence assessment to see if such a model can inform actual antitrust evidence assessment even further.

5.3.3 The impact of institutional biases

Decision makers are utility maximizers

A decision maker's preferences for alternative actions are dependent on the decision maker's net utility. By net utility, in this context, is meant the utility of an action minus the personal costs and efforts of taking that action. An antitrust decision maker's net utility of taking alternative actions is affected by, inter alia, career opportunities, salary, recognition, political preferences, and not necessarily, an intrinsic preference to make objective rational decisions.⁴⁵² As long as the decision maker has some discretion in assessing evidence, the decision maker has an incentive to establish facts that are in line with his own preferences.

⁴⁵² See Posner (2008) p. 57 f. and Posner (2011) p. 725 f. The analysis of what judges maximize in Posner (2008) p. 57 f. and Posner (2011) p. 725 f. is based on adversarial judges. Inquisitorial decision makers might also be compared to bureaucrats. There is much literature in the field of public choice on what bureaucrats maximize. Seminal contributions are Tullock (1965), Downs (1967) and Niskanen (1971). See also Mueller (2003) p. 359 f.

An antitrust decision maker's actions to maximize his net utility are likely to depend on whether the system is inquisitorial or adversarial. Furthermore, a decision maker's utility-maximizing actions are likely to depend on whether the decision maker is directly politically appointed or whether the decision maker is appointed by political principals. Furthermore, the actions are likely to depend on whether the decision maker is an independent adjudicator or a bureaucrat in a hierarchic system. In addition, the utility maximizing actions may be dependent on whether a decision maker is appointed for lifetime or for a limited period subject to or not subject to renewal.

Below, some incentive factors likely to affect an antitrust decision maker's assessment of evidence are presented.

Interest group influence and rent-seeking

The interest group theory is based on the general public choice theories on how public officials decide, normally under the condition that they are agents for voters in a democratic system. Political elected decision makers act in self-interest and maximize their utility, which is dependent on political support measured in votes. To maximize the number of votes a policy must be chosen to maximize support. Money is important for outreach and election campaigns. In this context monetary support from interest groups is important.⁴⁵³ This means that politicians must weigh the profit interests of industries supporting their campaigns against the effects on votes from consumers that want low prices. This tradeoff in protecting special interest groups and consumers is analyzed formally by Stigler (1971) and Peltzman (1976). Cooperation with interest groups can also be important for political decision makers for other reasons. A firm can, for instance, influence the votes of its employees, and a labor union can influence the votes of its members.

As a starting point, it might seem that political inquisitorial enforcement bodies, such as the European Commission, are more prone rent seeking from interests groups than adversarial courts with independent judges. The possibilities to influence political bodies by legal means are easier than influencing independent judges in a trial. The distance between the appointments of commissioners in the European Commission and the democratic institutions of the member states is, however, quite long, as described in Chapter Two. This is likely to

⁴⁵³ By interest groups, what is meant is all organized units with common interest in the outcome. This can be affected firms and their related unions, user and consumer organizations, labor unions, and voluntary organizations.

mitigate the Commissioners incentives to systematically protect special interests compared the decisions of political decision makers that are elected directly.

Rent-seeking from special interests is also about who are most effective at representing their interests and who spends most in presenting evidence and arguments that support their case. Becker (1983) modeled interest group influence as competition between many interest groups with conflicting interests. The group spending most on influencing will be most successful in having its interests implemented in the decision. It is the relative spending that is important. If two opposing interest groups spend equally on support, their support levels will cancel each other out. Thus, there is a game where the support from one interest group is dependent on the support of the other interest group. The result is dependent on which group is best organizing and representing their interest to the decision maker. Interest groups with a few wealthy members, but where each member is heavily impacted by some regulation, will presumably be better promoting their interest collectively than a large group with many members where each member only suffer a minor impact of the regulation. This might be the case even when the total impact on the bigger group is larger. The reason is that, in a group, each member will have an incentive to free-ride on the efforts on the others. If little is at stake for each individual separately, this “problem” might have substantial effects. This means that, as a main rule, concentrated interests will have more impact on public decisions than dispersed interests, according to the interest group theory. From the relative spending point of view, it has been argued that an adversarial court system is likely to be more prone to rent-seeking than an inquisitorial system.⁴⁵⁴ The argument is that an inquisitorial enforcement authority, as a starting point, can be considered as a body that seeks the objective truth in an efficient way, while an adversarial court is more of a playing field where parties can spend enormous resources on rent-seeking without being stopped. Thus, adversarial courts may be a better playing field for rent-seeking.

It is not possible here to draw robust conclusions as to whether politically supervised inquisitorial enforcement authorities or an adversarial system are most subject to rent-seeking biases overall. That being said, interest group influence will work differently in systems where the decision maker has an incentive to protect certain interests as described above, and in systems where rent-seeking influences the decision just because one group spends more money. In the first case, a decision might be epistemologically wrong because the decision maker has an incentive to make a wrong decision, possibly against better knowledge. In the

⁴⁵⁴ Tollock (1980, 1988).

second situation, the rent seeker must try to exploit other imperfections and biases associated with the decision making to prevent the decision maker from making a rational decision. Thus, rent-seeking is an intrinsic source of bias in the first situation, while the biases from rent seeking must be derived from other sources of biases in the second situation. This is an argument that rent-seeking influence is a worse problem in the first situation.

When it comes to the influence of rent-seeking through spending efforts the theory is not clear on whether the inquisitorial system or adversarial system performs worse, as just described. There are risks of rent-seeking biases in both the inquisitorial system in the EU and the adversarial system in the US. The persons subject to antitrust scrutiny often represent concentrated monopoly rents with a strong interest in protecting their monopoly profits. Thus, the possibility of rent-seeking is likely to be biased towards monopoly interests. This may systematically bias decisions and the corresponding evidence assessments towards non violation findings. The incentives to spend resources on rent-seeking will be studied in more detail within economic models of evidence assessment below.

Imperfections in evidence assessment associated with principal agent issues

Often, legal decisions are not done by the political elected persons directly, but by public officials appointed by the politically elected persons. The employed public officials maximize their own utility subject to those incentive mechanisms provided by the politicians hiring them. The public officials may be independent judges who cannot be instructed by the politicians after they are appointed. If these independent judges are dependent on the politicians for a career in the judiciary, this may, however, give the politicians some control. US Supreme Court judges are appointed for life, inter alia, to avoid such influence. Bureaucrats, on the other hand, are employees and agents for their political superiors, usually subject to the instructive powers of the political superiors.⁴⁵⁵ The administrative personnel of the European Commission are bureaucrats in this sense. The politicians must then use incentives schemes to encourage the bureaucrats to implement their desired politics.

After the appointment of independent judges, the possibility of using incentive mechanisms is limited ex post. Politicians can, to some extent, increase and reduce budgets. If the politicians don't like the decision of one particular judge, they may increase the number of judges to reduce the average number of cases that will be handled by this judge. One of the most important instruments for the politicians in controlling independent decision makers is to

⁴⁵⁵ Some bureaucrats may be subject to limited instructive powers. This usually applies to heads of competition authorities and other regulatory bodies to secure the professional legitimacy of these bodies.

appoint decision makers with the desirable preferences.⁴⁵⁶ This is quite apparent when it comes to the appointment of Supreme Court justices in the US.⁴⁵⁷ Thus, the preferences of the judges are likely to at least be correlated with the preferences of the politicians that appointed them. Consequently, they may have some biases towards certain interest groups due to a selection effect.

The possible imperfections and biases on evidence assessment that might result from self-interested independent judges are quite diverse.⁴⁵⁸ It will be beyond the scope of this study to discuss this fully. However, some comments are due. We can assume that whatever a judge pursues, he will try to achieve this with as little effort as possible. This might have certain implications for evidence assessment. If a judge wants to minimize the efforts in assessing evidence, he might choose to rely on past experiences as a substitute to a careful scrutiny of the facts of the case.⁴⁵⁹ This might bias the decisions towards prior decisions, causing a problem of path-dependence. Important differences in facts that call for another evidence assessment might not be discovered. This is returned to in the discussion of analogical reasoning below. This problem can be used as an argument for jury trials as jury members are less experienced with similar cases, and are then less prone to substitute a careful assessment of evidence with past experiences.⁴⁶⁰

Bureaucrats subject to the instruction powers of the political principals can, in principle, be instructed to do exactly as they are told as a condition for their salary. It is not so easy, though. Bureaucrats possess private information regarding the probative force of evidence, decision value of evidence, and the costs of gathering evidence. This gives the bureaucrats some discretion in assessing evidence in the pursuit of personal preferences.⁴⁶¹ An imperfection associated with evidence assessment is the so-called prosecutorial bias.⁴⁶² The prosecutorial bias explains why inquisitorial enforcement authorities, such as the European Commission, may be subject to a bias in favor of finding violations. Prosecutorial bias is a bundle of biases that covers both incentive biases and cognitive biases, such as the

⁴⁵⁶ Posner (2011) p. 726 f.

⁴⁵⁷ See Posner (2008).

⁴⁵⁸ See Posner (1999) and Posner (2011) p. 725 f.

⁴⁵⁹ See Posner (1999) and Posner (2011) p. 824.

⁴⁶⁰ See Posner (1999) and Posner (2011) p. 824. As also pointed out by Posner, past experience is also an advantage that might make the evidence assessment more accurate if taken into account together with a careful assessment of the evidence in the case in question. Thus, lesser risk of substitution of a careful assessment of evidence with past experiences associated with juries is just one argument for juries, but not necessarily an argument that juries overall assess evidence better than judges.

⁴⁶¹ There is much literature in the field of public choice on what bureaucrats maximize. Seminal contributions are Tullock (1965), Downs (1967), and Niskanen (1971). See also Mueller (2003) p. 359 f.

⁴⁶² See Wils (2004).

confirmation bias and the hindsight bias.⁴⁶³ Cognitive biases will be returned to below, while the incentive part of the prosecutorial bias is discussed here. The incentive bias arises because those who assess evidence are awarded differently depending whether they find violation or not. Typically, enforcement authorities are more recognized for doing something than not doing something. Naturally, what is done is more measurable and visible than what is not done. Thus, finding violations are more likely to be beneficial for the funding of the authority and career of the employed officials.⁴⁶⁴ It has been argued that the European Commission is subject to incentive biases in favor finding violation.⁴⁶⁵ Some of the reforms imposing checks and balances in the enforcement of the European Commission described in Chapter Two aim to limit the impact of such biases. These reforms will be returned to in the discussion of cognitive biases below.

An additional point is that, with enforcement officials as with judges, it is reasonable to assume that enforcement officials would prefer to pursue their goals with as little effort as possible. This might have an additional consequence for evidence assessment in inquisitorial law enforcement systems. Since the inquisitor has control over the evidence gathering, he would prefer to shift as much as possible of the cost of evidence production to other parties. This can be achieved by presumptions against the investigated parties. A consequence of this is a bias towards too strong presumptions favoring violation in inquisitorial systems. The stricter presumptions being used in the EU than in US, in particular when it comes to the enforcement of abuse of dominance,⁴⁶⁶ is at least consistent with such a theory. This point is revisited in the modeling of actual evidence assessment below.

5.3.4 The impact of cognitive biases

Behavioral economics and cognitive biases

The branch of economics called behavioral economics intersects with psychology and studies actual evidence assessment and decision making. Studies in behavioral economics have revealed that cognitive biases might lead to evidence assessments and decisions that systematically deviate from what objectively seem rational. Behavioral economics was briefly described in Chapter Three.

⁴⁶³ Wils (2004).

⁴⁶⁴ See Posner (2011) p. 847 for a discussion of incentives in public enforcement agencies. See Wils (2004) for a discussion of incentives in the European Commission.

⁴⁶⁵ See Wills (2004) and Geradin and Petit (2010).

⁴⁶⁶ See Geradin and Petit (2010).

D. Kahneman and A. Tversky⁴⁶⁷ have provided important knowledge of cognitive biases in decision making through extensive seminal research on the topic, e.g., Kahneman and Tversky (1973) and Kahneman et al. (1982). Examples of cognitive biases are the base rate fallacy on how people fail to take into account prior probabilities in their probability assessment and the loss aversion theory on how people irrationally prefer avoiding losses to making gains.⁴⁶⁸ Some irrationality in decision making associated with cognitive biases can be explained by evolution and rationality. Since the brain has limited resources, it can sometimes be rational to be “bounded” rational and make decisions that might appear irrational when weighing the saved brain resources against the quality of the decision.⁴⁶⁹ This is not a new idea, but was pointed out by the Nobel laureate in economics, Herbert Simon, already in the 1950s.⁴⁷⁰ One can say actual decision making rationally utilizes heuristics as a result of evolutionary efficiency.

There is extensive literature on behavioral economics in legal settings,⁴⁷¹ which also includes literature covering antitrust law in particular.⁴⁷² Experiments have, for instance, been done on mock juries, and large deviations from rational evidence assessment are revealed. Below it will be discussed how some cognitive biases can distort the actual evidence assessment in antitrust to deviate from a rational assessment of evidence. This will not be an exhaustive list of cognitive biases, but rather a selection of those biases most relevant for actual antitrust evidence assessment.

The base rate fallacy

A cognitive bias with the upmost importance for studying actual assessment of legal evidence is the base rate fallacy.⁴⁷³ This is also known as the prosecutor fallacy. The base rate fallacy has empirical support.⁴⁷⁴ The base rate fallacy is a systematic failure to take into account a priori probabilities in evidence assessment. This can easily be illustrated by an example.

Let us say that we know that the chance that a random firm is involved in a price conspiracy is 0.001, which is 0.1 percent. Let us say that we found that, in the presence of

⁴⁶⁷ D. Kahneman was awarded the Nobel Prize in Economics in 2002 for his works with A. Tversky. Had Tversky been alive at the time they would probably have received the prize together.

⁴⁶⁸ McKenzie (2010) contains an updated and critical survey of some of the research.

⁴⁶⁹ See McKenzie (2010) chapter 7 and 8.

⁴⁷⁰ See Simon (1955) and Simon (1957). Simon was awarded the Nobel Prize in economics in 1978.

⁴⁷¹ See Sunstein (2000) and Farnsworth (2007) for surveys.

⁴⁷² See for instance Wils (2004), Tor (2004) and Stucke (2007).

⁴⁷³ Kahneman and Tversky (1973). See also Lipton (2004) p. 109 f.

⁴⁷⁴ Kahneman and Tversky (1973). The base rate fallacy has been subject to numerous experiments; see Farnsworth (2007) p. 281 f. Informal base rate fallacy experiments are usually performed on students in introductory economics and law and economics courses. Usually, the base rate fallacy is confirmed.

illegal price conspiracy, the probability of non-changing prices over more than a one month is 70 percent. Assume further that finding non-changing prices over more than a one month period, if there was no price conspiracy, is just 0.7 percent. This means that finding the evidence of non-changing prices over a one month period is 100 times more likely when there has been a price conspiracy than if there was no price conspiracy.

Assume that a random firm is picked out for scrutiny and evidence, e , is found that the company's price has been non-changing for more than one month. Is it probable that this firm was involved in a price conspiracy? Let e be the evidence of non-changing prices over one month. From the theoretical framework derived above, we know that

$$p(\text{conspiracy}|e)/p(\text{not conspiracy}|e)= \\ [p(e|\text{conspiracy})/p(e|\text{not conspiracy})]*[p(\text{conspiracy})/p(\text{not conspiracy})].$$

The likelihood ratio $p(e|\text{conspiracy})/p(e|\text{not conspiracy})$ is $0.7/0.007$, which is 100, as just stated. Furthermore, we know that, a priori, if we pick a random firm, the probability ratio that this firm is involved in a price conspiracy relative to that it was not involved in a price conspiracy is $p(\text{conspiracy})/p(\text{not conspiracy})$ which $0.001/0.999$. This means that if we pick a random firm it is about one thousand times less likely that the firm is involved in a price conspiracy than not. This gives us that

$$p(\text{conspiracy}|e)/p(\text{not conspiracy}|e)=100*[0.001/0.999]=0.1001.$$

Thus, even where we have evidence which is 100 times more likely given that there was a price conspiracy than not, the probability that the firm was involved in a price conspiracy is still ten times less than the probability that the firm was not involved in a price conspiracy. This is, of course, due to the difference in the a priori base rates. We can calculate

$$p(\text{conspiracy}|e)= \\ p(e|\text{conspiracy})p(\text{conspiracy})/p(e)= \\ [p(e|\text{conspiracy})p(\text{conspiracy})]/ \\ [p(e|\text{conspiracy})p(\text{conspiracy})+p(e|\text{no conspiracy})p(\text{not conspiracy})] \\ 0.7*0.001/[0.7*0.001+0.007*0.999]= \\ 0.0007/0.0077=0.09,$$

which gives

$$p(\text{not conspiracy}|e)=0.91.$$

Thus, given the evidence e , the probability that the random firm is involved in a price conspiracy is only 9 percent. This is because of the base rate of only 0.001 of being in a price conspiracy in the first place. There will still be many more firms not involved in a price conspiracy that have unchanged prices for more than a month. According to the base rate fallacy, many people would perceive the probability of a price conspiracy given e as higher than 9 percent, maybe as high as 70 percent because this is the probability of the evidence given the price conspiracy.⁴⁷⁵

The base-rate fallacy is probably now so familiar among legal decision makers that it is not likely to be such a big fallacy as experiments may suggest. Even if judges should not be aware of this fallacy, the lawyers of parties who are disadvantaged by the base rate fallacy will make the decision makers aware of it. However, juries may be less familiar with the base rate fallacy, and may not fully understand the concept, even if the lawyers address it. Thus, the base-rate fallacy is likely to be a bigger obstacle to rational evidence assessment in US jury trials, than in the EU enforcement, which does not operate with juries.

Conjunction fallacy

Another cognitive bias with a particular relevance for evidence assessment is the conjunction fallacy. Empirical research has shown that people in some cases find a less probable hypothesis more probable because it provides a better explanation due to assumptions that have explanatory power.⁴⁷⁶ More precisely, this means that a hypothesis might be perceived as more probable even when the hypothesis has more assumptions that make the hypothesis less probable. The reason for this is that the assumptions provide more explanation and understanding. A hypothesis that includes an assumption is entailed by the same hypothesis not including the assumption. Thus, the hypothesis not including the assumption is more general and more probable by deductive logic.

⁴⁷⁵ Proponents of causal decision theory might disagree on the rationality of taking into account base rates, as base rates are often not causally relevant for the decisions, see, for instance, Stein (2011). That only 0.1 percent of firms empirically are involved in price conspiracies is casually irrelevant for the question of whether a particular firm is involved in a price conspiracy. The logical issues of causal decision theory were addressed above. It would be irrational to not take into account base rates. More context-specific information will, however, refute the presumptions of base rates when it is due. When more and more context specific evidence is gathered, the impact of the base rates will be less and less.

⁴⁷⁶ See Lipton (2004) p. 110 f., Kahneman et al. (1982), and Tversky and Kahneman (1984).

An example of the conjunction fallacy inspired by literature cited above is the hypothesis that Anna works in a bank, is politically active, and went to a political protest. This hypothesis sounds more probable than the hypothesis that Anna works in a bank and went to a political protest. The first hypothesis offers more explanation, but the latter is objectively more probable as it has fewer assumptions. The last hypothesis does not preclude Anna being political active and entails the first hypothesis.

We can construct another example based on competition law. Assume we have two hypotheses. The first one is that the competitors, A and B, for a long time had small margins and entered into a price conspiracy. The second is that competitors A and B entered into a price conspiracy. The first hypothesis says something about the purpose or intention about the conspiracy, which make a better explanation than the second. It might, therefore, be perceived as more probable than the second one; even the second one is objectively more probable. The first hypothesis is included in the second.

The conjunction fallacy can also be applied by defendants in presenting an alternative explanation for some alleged competitive conduct. Suppose some company alleged to have restricted competition by refusing to give some interoperability information to competitors, argue that this is necessary to protect intellectual property to promote innovation in a market that is highly innovative.⁴⁷⁷ Although the hypothesis that refusing to give interoperability information is necessary to protect intellectual property to promote innovation is more probable than the hypothesis that refusing to give refusing to give interoperability information is necessary to protect intellectual property to promote innovation in a market that is highly innovative, the last hypothesis might seem more probable as it offers more explanation for the need to protect intellectual property rights.

Another reason for the conjunction fallacy, in addition to the better explanation provided by more assumptions, might be that the one assessing the probability confuses assumptions with evidence. In general, we have that $p(H|e)$ might be bigger than $p(H)$, while $p(H|ne)$ is always less than (or equal to) $p(H)$. It might, for instance, be that the probability that a firm enters into a price conspiracy given that it had low margins for a long time is greater than the probability that the firm enters into a price conspiracy in general. Still, the probability that a firm enters into a price conspiracy must be larger than the probability that a firm both enters into a price conspiracy and has had low margins for a long time. In other

⁴⁷⁷ Loosely based in the Microsoft-cases in EU; see, for instance, Microsoft Corp. v. Commission Case T-201/04, CFI [2007]

words, the hypothesis that the competitors A and B entered into a conspiracy might be more probable given the evidence that they had low margin for a long time. The long time with low margins is, however, not evidence here, but an assumption as a part of a hypothesis.

The conjunction fallacy is probably well known among professional antitrust decision makers trained in assessing complex evidence. It is doubtful that there is a very large risk that professional decision makers will confuse assumptions that provide a better explanation of evidence with evidence. If some assumption is made to make a better explanation, some evidence for this assumption will normally be required. If, for instance, low margins are used as an argument for the presence of a price conspiracy, both evidence of such low margins and a theory as to why those low margins provided incentives to enter into price conspiracy will normally be required. Thus, both the evidence and some explanation of the probative force of the evidence will normally be required. However, sometimes it is not easy to keep track of assumptions, and even professionals are likely to be confused. If economic models are used to support inferences it might be difficult for a decision maker to assess all the explicit and implicit assumptions that make one model appear more explanatory than another economic model. One model might easily seem to give more explanation of the evidence because of more assumptions. The rationality in model-based inferences is returned to in Chapter Six.

The conjunction fallacy is more likely to occur in the use of jury trials with jurors not experienced or trained by regularly assessing legal evidence. The conjunction fallacy involves subtle issues that may not be understood even if pointed at by the lawyers. In particular, there is a risk of conjunction fallacy when narratives are used as a rhetorical instrument. Narratives may be filled with unproven conjunctions to make one story appear more convincing than another story. The use of narratives is returned to below.

Confirmation bias

Confirmation bias means that people tend to interpret evidence in a way most consistent with their priors.⁴⁷⁸ Another way to say this is that people tend to assess evidence in a way that confirm their established beliefs or hypotheses.

The confirmation bias has, in particular, been addressed as a problem in the inquisitorial procedure. Confirmation bias is an element of the so-called prosecutorial bias, which refers to the situation when prosecutors are biased in the decision making in favor of finding violation. Several studies have addressed the presence of prosecutorial biases in

⁴⁷⁸ See Posner (2011) p. 824.

antitrust decision making. Even if the process in the FTC follows an adversarial procedure, the commissioners in the FTC make the final administrative decisions.⁴⁷⁹ This was described in Chapter Two. A commissioner may have been involved in the earlier stages of the decision making. Coate and Klein (1998) revealed that commissioners that had been involved in the decisions making at an earlier stage were more prone to vote for violation than those who had not been involved. Wils (2004) uses statistics on court reversal rates, theory, and case studies to enlighten the presence of prosecutorial bias in the enforcement of the European Commission. Venit (2011) uses case studies as evidence for prosecutorial bias in the enforcement of the European Commission. Although the last two studies have anecdotal elements,⁴⁸⁰ they are quite informative and convincing. One case that is alleged to reveal the prosecutorial bias of the European Commission is the *Airtours*⁴⁸¹ case. In this case, the court found that the Commission had committed several errors in the evidence assessment, and some of these were related to not carefully assessing the evidence and arguments provided by the parties. The Commission has made some reforms to address inter alia the risk of prosecutorial biases.⁴⁸² A separate hearing officer ensures that the hearings in the case are performed satisfactory, and a chief economist outside the administrative hierarchy of the specific case gives advice to the decision makers. Furthermore, the Commission has developed best practices to secure the involvement of the parties in the process. It has also established systems of peer review to secure that all cases are scrutinized with the fresh eyes of new case handlers in the procedure. These reforms are likely to have mitigated the impact of prosecutorial biases in the EU competition enforcement.

As a counter-effect to the confirmation bias towards violations, an experimental study performed by Lyons et al. (forthcoming), is informing. In this study Lyons et al. tested the actual assessment of evidence in merger control on experimental groups, including one group consisting of antitrust officials. The authors found a null-hypothesis bias in the terms that the test-subject seemed to show a tendency to be reluctant to deviate from the null-hypothesis of no harmful effects. This study is not very informative when it comes to confirmation bias in favor of violation. It addresses an initial assessment of evidence, and not how the test subjects

⁴⁷⁹ The decision of the Commission is subject to judicial review.

⁴⁸⁰ As also pointed out by Wils (2004), single cases cannot be used to infer systemic effects.

⁴⁸¹ *Airtours plc v Commission of the European Communities* Case T-342/99 [2002]. Venit (2011) also points out *Italian Flat Glass (SIV v. Commission, Joined Cases T-68/89, T-77/82 and T-78/89, [1992])* and *Tetra Laval (Tetra Laval BV v Commission of the European Communities T-5/02 (CFI) [2002], C-12/03 (ECJ) [2005])* as decisions revealing that the European Commission was subject to a prosecutorial bias.

⁴⁸² See Wils (2004), OECD (2010), Geradin and Petit (2010), and Venit (2011).

would assess new evidence after a first assessment in favor of violation.⁴⁸³ Still, if it is so that antitrust decision makers are biased towards non-intervention in the first place, this could mitigate some of the problem with the confirmation bias in favor of violation. The reason is that it is a barrier for decision makers to come to such a confirmation bias situation in the first place.

Another dimension of confirmation biases that also applies to adversarial judges is the impact of priors due to the decision makers' experiences with similar cases.⁴⁸⁴ This is an isolated argument for jury trials since jurors are less subject to such priors.

It follows that the confirmation bias is likely to affect antitrust decisions. Empirical evidence and theoretical research seems to indicate that the confirmation bias constitutes a systematic bias towards finding violations in inquisitorial systems.

Hindsight bias

The hindsight bias is to ex post exaggerate the ex ante probability of some event.⁴⁸⁵ Simply said, hindsight bias is to overestimate the probability of the event that actually occurred. The hindsight bias is also relevant for legal assessment of evidence. It might especially affect the ex-post assessment of the appropriate ex-ante assessment of the probabilities of the alternative outcomes of some conduct. Given the knowledge of the actual outcome resulting from some conduct, the probability of this outcome is assigned a higher probability than if the person didn't know the outcome, even if he is told to ignore the knowledge of the actual outcome. This is particular relevant in the assessment of negligence when negligence is a requirement for liability.

In empirical studies,⁴⁸⁶ test groups have been asked to assess what outcome is most likely given some evidence. In one group, the members have not been told the actual outcome, in the other group the members are told the outcome, but asked to only assess the probabilities in light of the evidence, disregarding the knowledge of the actual outcome. Members of the last group will systematically be biased towards assessing the actual outcome as more probable than the first group. It is rational to use knowledge of the actual outcome as evidence for the probability of the actual outcome, but the test group was supposed to ignore that information.

⁴⁸³ This could however be a very interesting extension of the study by Lyons et al. (forthcoming).

⁴⁸⁴ Posner (2011) p. 824.

⁴⁸⁵ See for instance Posner (2011) p. 23.

⁴⁸⁶ See Farnsworth (2007), Chapter 23, for examples and references to various studies.

When the alleged negligence of some person is assessed, the question is whether the person could, to a reasonable degree, have foreseen the outcome of the alleged negligent conduct before the outcome materialized. The decision makers, however, know the actual outcome. The decision maker will then, according to the hindsight bias, systematically overestimate the person's ability to foresee the outcome, and might then too easily find negligence. When antitrust fines are imposed, intent or negligence is a condition for the liability for fines. The negligence standard is related to the ability to foresee the potential anticompetitive effects of some conduct. If the one who assess the evidence have observed actual anticompetitive effects, this might make him overestimate the possibility of the person charged to foresee those anticompetitive effects.

Wils (2004) points at a rather subtle effect of the hindsight bias in antitrust evidence assessment, which makes the hindsight bias to be an element of the prosecutorial bias. Since the hindsight bias makes a person overestimate the ability to predict an outcome, it will cause discomfort to observe an outcome that one didn't predict. Thus, one will avoid this discomfort by avoiding observing evidence for such an outcome. Wils (2004) applies this to merger control as an example. If a person who decides that a merger should be subject to further scrutiny, in a so-called phase II investigation, discovers evidence that the merger is not harmful to competition, this will cause discomfort because the decision maker will overestimate his ability to be able to have seen that the merger was not harmful in the first place. Thus, the decision maker will get insecure in his own judgment abilities and tend to avoid such evidence, which then will lead to a biased evidence assessment towards violation. It might be questioned whether this subtle effect is best categorized as hindsight bias or just a part of the confirmation bias. It is, however, an element that explains and strengthens the prosecutorial bias. Thus, this is an additional factor that contributes to a systematic effect of finding violation in inquisitorial systems.

On the question on how to avoid the hindsight bias, Farnsworth (2007)⁴⁸⁷ suggests that the one who assesses the evidence should be requested to estimate the probabilities of the other possible outcomes of the conduct in question. If person are asked to give an ex post assessment of the probability of all possible outcomes and not just the actual outcome, this will reduce the impact of the hindsight bias.

⁴⁸⁷ See Farnsworth (2007), Chapter 23.

Anchoring

The impact of anchoring is probably known to all tort law lawyers. Anchoring can bias the assessment of evidence towards some reference point, even when the reference point is without merits.⁴⁸⁸ If a person is asked to assess some evidence given some reference without any probative force as such, the reference might still affect the assessment. This is best illustrated with tort litigation. In experiments, mock jurors have been given some evidence to assess damages based on this evidence. In addition, they have been told the claimed damages from the plaintiff. The jurors systematically awarded higher damages the higher the claim from the plaintiff, even the evidence was equal.⁴⁸⁹

Anchoring might also be of relevance in the assessment of evidence in antitrust cases. In antitrust damages, anchoring is relevant as just described. Anchoring may, however, be of relevance in other aspects of antitrust cases. The parties in the case will benefit from boosting economic calculations that support their claims. The plaintiff may have an interest in boosting the overcharge resulting from the violation. The defendants may have an interest in boosting the size of the efficiencies resulting from an alleged violation to establish an anchor.

It is difficult to avoid claims serving as anchors in legal cases. Presenting claims is an inevitable part of the nature of legal disputes. It is, however, possible to design mechanism to limit the benefit of attempting to exploit anchoring. In civil procedure, the incentives to exploit anchoring might be chilled by a liability to cover the opposite parties legal expenses if one is awarded lower damages than claimed initially. This means a liability to compensate the opposite party's litigation cost even if one, isolated, wins the case, but on less favorable terms than claimed. This will reduce the incentives to boost the claim to exploit the anchoring bias. This is partially implemented in the procedural rules both in the US⁴⁹⁰ and EU⁴⁹¹.

The bias from anchoring is likely to be well known by professional legal decision makers. Thus, the risk of bias from anchoring is likely to be higher in jury trials.

Self-serving bias

Another bias that might affect the evidence assessment is the so-called self-serving bias.⁴⁹² If the result of an assessment of evidence for some reason feels better for the one who assess evidence than alternative more likely assessment, from an objective point of view, the one

⁴⁸⁸ See, for instance, Farnsworth (2007) p. 230 f.

⁴⁸⁹ Farnsworth (2007) p. 230 f.

⁴⁹⁰ Federal Rules of Civil Procedure, Rule 54.

⁴⁹¹ A loser may be imposed to pay the legal cost of the winner. The winner has not fully won if he receives less than he claims. The legal costs reimbursed may be reduced accordingly.

⁴⁹² See Farnsworth (2007) Chapter 26.

who assess evidence might still find the first one more likely. Some direct interest in the outcome of the evidence assessment might, of course, affect the evidence assessment argued for, independently on what the one who argue really believes is the correct assessment. This is an incentive bias and not a cognitive bias, and is not what is meant by a self-serving bias. A real self-serving bias affects the actual assessment as such. In tort cases, the injured is likely to consider the economic harm suffered as higher than injurer's assessment of the same harm. An antitrust competitor plaintiff in a monopolization case may consider his actual harm to business as higher than the plaintiff does.

Some interest in the outcome of the assessment is not necessary for the presence of a self-serving bias. It might just be that one likes an assessment of evidence better than another one. One would simply feel more comfortable if one assessment of evidence was truth rather than an alternative. In the philosophy literature, the loveliest explanations, which are the explanations one like most, of some evidence are distinguished from the most likely explanations of some evidence.⁴⁹³ The loveliest explanation does not need to be the most likely. Still, the loveliest is the one that is believed. This can, for instance, explain why many believe in conspiracy theories even though they fail Occam's razor⁴⁹⁴ by not being the explanation with fewest assumptions consistent with the evidence. Complicated conspiracy theories involving a conspiracy of some powerful evil minds might give a "lovely" justification for the perceived problems in the world. This might seem lovelier as a scapegoat is identified.

Distinguishing the loveliest and the most likely explanation might also have relevance in antitrust evidence assessment. However, it is not obvious that this has some systematic effect in either finding violation or not violation. This can be illustrated with some hypothetical examples. Many people will probably find an explanation from a company alleged for violating antitrust law that their conduct was necessary to meet competition from ruthless foreign competitors in securing national employment more lovely than the explanation that the company ruthlessly wanted to eliminate competition detrimental to the consumers. The threat from unemployment and ruthless foreign companies is something that creates fear in many people who would like to think that something is done against it. Furthermore, it is lovelier to think that respectable companies, where many of us have friends and family working, are not engaged in some illegal harmful conduct. In this situation, the self-serving bias favors not violation. A bias towards the loveliest explanation might also

⁴⁹³ See Lipton (2004) p. 142 f.

⁴⁹⁴ Occam's razor and the principle of parsimony will be returned to in Chapter Six.

favor violation. Many might feel some loveliness and comfort in thinking that successful businessmen have achieved their fortune as a result of unlawful, anticompetitive behavior. This provides some justification for not being as successful in business oneself. Thus, it is difficult to make some conclusions on the systematic impact of the self-serving bias on antitrust evidence assessment.

Summary of the impact of cognitive biases

In this subchapter some of the cognitive biases most relevant for antitrust evidence assessment and how these biases are relevant and likely to affect antitrust decisions were discussed. For some biases, there is general empirical support, while for some it is empirical support for their presence in a legal setting. Some biases are even studied in the specific antitrust context.

It was found that there is a risk that biases from the base rate fallacy, the conjunction fallacy, anchoring, and the self-serving bias may influence antitrust decisions. However, it cannot be concluded that these biases are likely to systematically bias antitrust decision in the direction of finding either violation or not violation. It is likely that the risk of influence of these biases is higher in jury trials than when professional decision makers assess evidence. Thus, they are likely to be more relevant in the US where jury trials are more common in the decision procedure, compared to EU competition procedure that does not use jurors.

However, the confirmation bias and to some, but lesser, extent, the hindsight bias, seem to impose a systematic bias towards violation in inquisitorial systems, like in the EU competition procedure. The confirmation bias may also affect adversarial judges, as they tend to confirm their priors due to experiences with similar cases. The confirmation bias is not likely to systematically bias adversarial judges towards either violation or not violation, though. This is probably a bias that has less impact in jury trials than in adversarial processes with professional decision makers, as jurors lack the experiences necessary to establish confirmation biases.

5.3.5 Analogical reasoning

Analogical reasoning is an imperative instrument of practical abductive reasoning, both in everyday life and in the assessment of legal evidence. The idea is that similar cases should be assessed and decided similarly. The use of analogies in evidence assessment and decision making can be a meritorious method of inference when there are sufficiently comparable cases to base the analogies on. Previous assessments can be considered as accumulated capital

that can save the duplication of assessment costs. Lipton (2004)⁴⁹⁵ stresses the importance of contrastive inference in the inference to the best explanation in the presence of complex evidence. For contrastive inferences, analogies serve as bases for the contrasts. Gilboa (2009) discusses the performance of case-based reasoning as a tool for practical decision making, where analogies have an important role.⁴⁹⁶ Methods in artificial intelligence used to aid decision making, such as neural networks⁴⁹⁷ and “nearest-neighbor” classification,⁴⁹⁸ are based on analogies from other cases. Even statistical inference can be seen as using the principle of analogy since the situations that are used as a basis for statistical induction are often not identical to the situation we want to predict. Here we will, however, think about analogical reasoning as a more intuitive heuristic instrument where some similar case is used as a benchmark for how evidence should be assessed.

Appeal to analogies is one of the most common methods of legal argumentation.⁴⁹⁹ Analogical reasoning is imperative in the interpretation and determination of rules. Analogies based on legal precedents, especially Supreme Court decisions, and to a lesser extent other court decisions, are important sources for interpreting the law. This was described in Chapter Four. Lawyers are central players in the legal assessment of evidence, both as representatives for the parties and as decision makers. Thus, it is natural that lawyers bring with them their particular tradition of analogical reasoning into the assessment of legal evidence. Precedents are the law applied to the facts in a former case. In the same way that precedents are used to argue for a particular interpretation of law, the precedents also include information concerning how evidence was assessed in previous cases. Analogy is the main principle to link the facts of a precedent to the present case, and this can be used both to argue for what the law is and how evidence should be assessed.

One does not need to read many antitrust decisions to see that the principle of analogy is used regularly as a source in the assessment of antitrust evidence. If one, for instance, read the US Supreme Court’s decision in *Bell Atlantic*,⁵⁰⁰ one will find references to how the evidence was assessed in *Matsushita*,⁵⁰¹ in particular, when it comes to the inferences made

⁴⁹⁵ See Lipton (2004) p. 71 f.

⁴⁹⁶ See Gilboa (2009) p. 171 f.

⁴⁹⁷ Witten and Frank (2005) p. 214 f.

⁴⁹⁸ Witten and Frank (2005) p. 235 f..

⁴⁹⁹ Walton (2002), Chapter 2.

⁵⁰⁰ *Bell Atlantic Corp. v. Twombly* 550 U.S. 544 (2007).

⁵⁰¹ *Matsushita Electronic Industrial Co. v. Zenith Radio Corp.* 475 U.S. 574 (1986).

from parallel behavior. A European example is *Wood Pulp*,⁵⁰² where the court similarly referred to the former decision, *Suiker Unie*,⁵⁰³ in drawing inferences from parallel conduct.

Although the use of analogy is usually a useful instrument for practical reasoning, there are some extra “dangers” to take into account when analogy is used to argue for a particular assessment of evidence. Thus, the focus here will be on some imperfections associated with the use of analogical reasoning that can bias antitrust evidence assessment.

As a main rule, the facts of the present case are not identical with the facts in the precedents. Similarities lay the grounds for the use of analogy. The analogy argument is that approximately equal evidence should be assessed similarly. A “brother” of the analogical reasoning is antithetical reasoning. The antithesis argument would be that if there are some differences in evidence, the evidence should be assessed differently. This will also be considered as a part of analogical reasoning.

The analogy or antithesis approach to the assessment of evidence may, if wrongly used, result in substantial deviations from a rational assessment of evidence.⁵⁰⁴ This can be illustrated by an example. Assume that in one former case where an illegal price conspiracy was found, there was evidence of identical pricing, substantial cost differences, and secret communication of prices. In the present case, there is evidence of identical prices, substantial cost differences, and prices are published on a public website. Based on analogy, the evidence here might be considered similar to the first case. In both cases, there are identical prices and substantial differences in cost. What distinguishes the cases is the third evidence. In the first case, this is secret communication of prices, but in the present case the prices are communicated on a public website. Argumentation based on analogy would be that the evidence in the present case is so similar that illegal price conspiracy must be concluded. Argumentation based on antithesis would be that secret communication of prices and public communication on a web site are so different that there is no price conspiracy in this case. The

⁵⁰² A. Ahlström Osakeyhtiö and others v Commission of the European Communities Joined cases C-89/85, C-104/85, C-114/85, C-116/85, C-117/85 and C-125/85 to C-129/85 [1993].

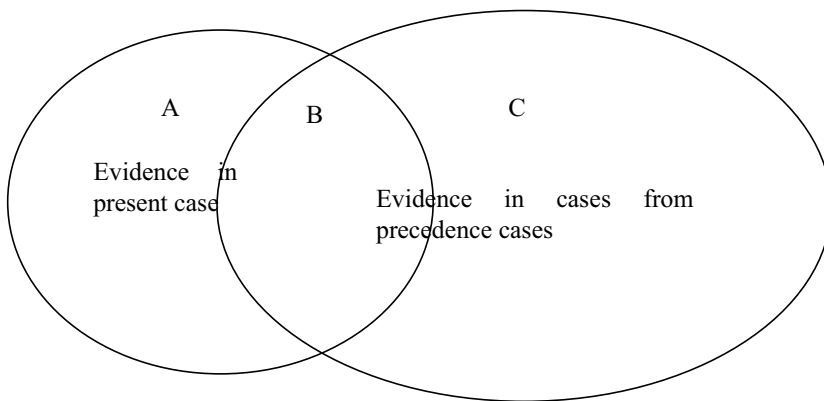
⁵⁰³ Sucres and denrées v Commission Joined Cases C-40/73, C-41/73, C-42/73, C-43/73, C-44/73, C-45/73, C-46/73, C-47/73, C-48/73, C-50/73, C-54/73, C-55/73, C-56/73, C-111/73, C-113/73, C-114/73 [1975].

⁵⁰⁴ There is a big difference in using an analogy in the determination of law and an analogy in the assessment of evidence. When analogy and antithesis are used in the interpretation of law, the purpose of the law will support the goodness of either the analogy or the antithesis argument. This was described in Chapter Four, where an analogy may serve as an idea of how to determine the law, but subject to a check against the purpose of the law. If, for instance, the law says that it is illegal for competitors to agree upon price, an analogy argument would be that it would be illegal for anyone to agree upon price. The antithesis argument would be that it is legal for non-competitors to agree upon price. The antithesis seems more valid in this case since the purpose of the rule is to prevent the restriction on competition, not any agreement on price. When analogical reasoning is used in evidence assessment, we do not have any such purpose to assess the validity of the analogy.

question will then be if the evidence is so similar or so dissimilar that either a price conspiracy can be concluded or not concluded. To answer this question correctly, we must turn to the question of what we are really going to prove: a price conspiracy. Is a price conspiracy more consistent with the evidence in the former case than in the latter? However, if we are going to do this direct assessment, then what is the point of using the analogy in the first place? Why not assess directly whether the total evidence supports a hypothesis of price conspiracy?

To just compare “similar evidence” or “dissimilar evidence” independently of what is actually going to be proven and separately from the total evidence is not likely to yield a rational evidence assessment. The evidence assessments in former cases were based on what evidence that was present in these cases. There will be no counterfactual assessment of what the result of the evidence assessment would have been in that case, had the evidence been different. However, when argumentation from analogy or antithesis is based on a former case where the fact is different, this is a de facto a counterfactual assessment of the previous case. In the case of analogy, the assessment of evidence in the former case is assumed to have been the same if the present evidence was the evidence in the previous case. In case of antithesis, the assessment of evidence is assumed to have been different if the present evidence was the evidence in the previous case. The use of analogy and antithesis is illustrated in Figure 5.2.

Figure 5.2: analogy and antithesis from precedence in the evidence assessment



In Figure 5.2, the left circle is the facts in the case that is under scrutiny. The right circle is the facts in the previous cases. A is the evidence that are unique in the present case compared to the precedence cases. C is the evidence that was present in previous cases that are not present

in the present case. B is the evidence that is common in the present case and the previous cases. Thus, B is the evidence that forms the basis for an analogy assessment of evidence. The danger with this analogy assessment is that the difference given by A and C might make a different assessment of evidence rational. The differences given by A and C form the basis for an antithesis argument. Since A and C are different in the two cases, the cases should be assessed differently, according to the antithesis argument. This antithesis would, however, be wrong if it is the similarities given by B that are determining for the assessment of evidence. The grounds in the previous cases would normally not say anything as to what the assessment of evidence would have been if A had been present. The only way to find out is to assess what impact A has on the evidence assessment. However, if a correct assessment of evidence is the standard for determining whether an analogy or antithesis is correct, then what is the point of using the analogy or antithesis?

As said above, analogy and antithesis can be informative for contrastive reasoning in saving the cost of a new full-fledged assessment. This will work best the more the cases have in common and the more certain we are as to what facts are determining for the assessment. This means that analogies and antitheses are most successfully applied where it is an established practice that has been subject to scrutiny many times. Thus, with the danger of stating the obvious, analogies and antithesis are informative where there are substantial similarities. A risk is, however, path-dependence if the established practice in reality originates from one decision. Thus, the established practice should be based on independent assessments that have yielded the same result.

The parties and their lawyers are likely to search for argument by using creative analogies if there are no better analogies to base the argument on.⁵⁰⁵ The decision maker's job should then be to not accept this argument and to stop a costly assessment of similarities and differences when a direct assessment of the evidence in question will result in a cheaper, better, assessment than one based on such use of analogy. An example that may be illustrative is *Coca Cola v. Commission*,⁵⁰⁶ where one question was whether the European Commission should apply a market definition, and finding of dominant position from a previous case. Coca Cola was arguing that the Commission should do so. The court stated that

⁵⁰⁵ Searching for a similar case, whether it is for determining the law or for assessing the evidence, is normally the first lawyers do when faced with a case. Where similar cases are not found, more creative analogies must be applied to have a case as a benchmark.

⁵⁰⁶ The Coca-Cola Company and Coca-Cola Enterprises Inc. v Commission of the European Communities Joined cases T-125/97 and T-127/97 [2000].

*[m]oreover, in the course of any decision applying Article [102] of the Treaty, the Commission must define the relevant market again and make a fresh analysis of the conditions of competition which will not necessarily be based on the same considerations as those underlying the previous finding of a dominant position.*⁵⁰⁷

Thus, the court stated that market definition and assessment of dominance are questions of facts to be assessed afresh in each case. The Commission does not have to assess these facts with a previous assessment of facts as a benchmark.

The use of analogy to assess the facts is likely to work better to illuminate the facts in an adversarial process rather than an inquisitorial process. The reason is that in an adversarial process it is more likely that a meritless analogy presented by one of the parties will be refuted by the other party. In an inquisitorial process, the confirmation bias is likely to prevent the inquisitor from seeing the weak sides of an analogy. Thus, as far as analogy is an important practical method of evidence assessment, the adversarial process is likely superior in extracting a rational evidence assessment through the use of analogies. However, in jury trials where complex economic matters are to be assessed, such as in antitrust, it might be very difficult to see which analogies perform poorly and which perform better, especially when there are subtle differences that are likely to affect the outcome. This will mitigate some of the superiority of the adversarial process in the assessment of analogies.

5.3.6 Appeal to expert knowledge

The use of expert knowledge in antitrust

The use of expert knowledge is imperative in practical abductive reasoning.⁵⁰⁸ This is simply a special case of utilizing the knowledge of one who is in a better position to know than the decision maker.⁵⁰⁹ The appeal to use the knowledge of someone who is in a better position to know is one of the most usual methods of legal argumentation.⁵¹⁰ The starting point is that utilizing expert knowledge is an instrument to make decisions that are more accurate. However, in this subchapter it will be presented some arguments for how the use of experts also may bias antitrust decisions.

⁵⁰⁷ The Coca-Cola Company and Coca-Cola Enterprises Inc. v Commission of the European Communities Joined cases T-125/97 and T-127/97 [2000] paras. 81 and 82.

⁵⁰⁸ See Walton (2002) p. 239.

⁵⁰⁹ There is an epistemological asymmetry, see Lianos (2010).

⁵¹⁰ See Walton (2002) chapter 2.

In antitrust analysis, the relevant expert knowledge is, in particular, industry expert knowledge and economic expert knowledge.⁵¹¹ Economic expert knowledge has always been important in US antitrust and has become increasingly important in EU competition law.⁵¹²

Economic expert knowledge can enter its way to antitrust decisions in various ways.⁵¹³ First, the decision makers may refer to expert knowledge to support their differences. This might include reference to economic theories with or without reference to relevant journal articles. A US example is *Bell Atlantic*,⁵¹⁴ where the Supreme Court stated that

*[t]he inadequacy of showing parallel conduct or interdependence, without more, mirrors the ambiguity of the behavior: consistent with conspiracy, but just as much in line with a wide swath of rational and competitive business strategy unilaterally prompted by common perceptions of the market. See, e.g., AEI-Brookings Joint Center for Regulatory Studies, Epstein, Motions to Dismiss Antitrust Cases: Separating Fact from Fantasy, Related Publication 06–08, pp. 3–4 (2006) (discussing problem of “false positives” in §1 suits).*⁵¹⁵

Here the court refers to economic research to support their argument. Moving to the EU an illustrative decision is the decision of the European Commission in *Microsoft*,⁵¹⁶ where the Commission, inter alia, makes references to contemporary research on network effects. This theory is discussed in the court decision.⁵¹⁷

However, the decision makers not only refer to the theory. Antitrust cases also regularly involve economic experts in the decision-making process. In the adversarial procedure in the US, each party usually provides economists as expert witnesses.⁵¹⁸ Court appointed experts are also possible.⁵¹⁹ The use of court appointed experts in US has traditionally rarely been used in practice in antitrust cases, but its use has increased over the last decades.⁵²⁰ In the enforcement by the European Commission, both internal economic experts employed by the Commission and external economists assisting the Commission or the parties are involved in the decision making process. The Commission’s chief economist

⁵¹¹ Schinkel (2008).

⁵¹² Neven (2006).

⁵¹³ See Lianos (2010).

⁵¹⁴ *Bell Atlantic Corp. v. Twombly* 550 U.S. 544 (2007).

⁵¹⁵ *Bell Atlantic Corp. v. Twombly* 550 U.S. 544 (2007) at 254.

⁵¹⁶ Case COMP/C-3/37.792 *Microsoft* [2004].

⁵¹⁷ *Microsoft Corp v. Commission*, Case T-201/04, CFI, 2007. However, the court did not cite academic authorities explicitly. This is not usual for the EU courts. See Lianos (2010).

⁵¹⁸ Economists have naturally been involved earlier in the case. Both US DOJ and FTC employ economists, many at PhD level. In addition to this, they may have hired external experts.

⁵¹⁹ Federal Rules of Evidence, Rule 706.

⁵²⁰ See Lipsky (2003).

team employs PhD-economists, making the internal expertise in the European Commission strong. If the decision of the European Commission reaches the courts, the parties are assisted by economists at each side as advisors to the parties. The court may also appoint experts to aid them in the decision-making.⁵²¹

The focus of this subchapter will be to discuss the experts' power in determining the facts in antitrust cases and whether this eventual power of determining the fact is likely to bias the evidence assessment. Rationality in the assessment of economic models in antitrust analysis is discussed separately in Chapter Six. Thus, the topics of this subchapter will be explored further in Chapter Six.

The experts' power of the facts

The experts' power of the facts in antitrust evidence assessment has a formal side and a practical side. The formal side is whether the decision makers formally have to consider expert statements as established facts. The practical question is whether the experts de facto, have some power in determining the facts.

The experts' formal power to determine the fact in the US is limited. It is no general rule that says that the decision makers have to consider some expert statements as the established fact. It is the decision makers in the adversarial process that perform the assessment of evidence after hearing the experts. There are, however, a few limits. If a case is decided by the FTC and appealed to the courts, the FTC's finding of fact is reviewed under the substantial evidence standard.⁵²² Under this standard, the FTC's finding of facts will be upheld if it is supported by "*such relevant evidence as a reasonable mind might accept as adequate to support a conclusion.*"⁵²³ Thus, the courts will review if the FTC has made reasonable inferences based on the evidence. This leaves some discretion for the assessments of the FTC as an expert organ outside judicial review. In the EU, the formal powers of the experts are more extensive. The European Commission is an expert organ subject to limited review when it comes to complex economic evidence. This was described in more detail in Chapter Two. This means that the decision makers in the European Commission have some monopoly power as an expert organ in determining the facts.

⁵²¹ Rules of Procedure of the Court of Justice of the European Communities of 19 June 1991 (OJ L 176 of 4.7.1991, p. 7, and OJ L 383 of 29.12.1992 (corrigenda)), Article 47, and Rules of Procedure of the Court of First Instance of the European Communities of 2 May 1991 (OJ L 136 of 30.5.1991, p. 1, and OJ L 317 of 19.11.1991, p. 34 (corrigenda)), Article 70. See Lianos (2010) for a discussion.

⁵²² *California Dental Ass'n v. FTC*, 128 F.3d 720 (9th Cir. 1997). Vacated on other grounds in 526 U.S. 756 (1999).

⁵²³ *California Dental Ass'n v. FTC*, 128 F.3d 720 (9th Cir. 1997) at 725.

The de facto power of experts has probably more impact than the formal power. In the US, the experts may, on the contrary to lay witnesses, present inferences from evidence (opinions).⁵²⁴ Thus, experts have a “monopoly” privilege in drawing inferences from evidence. However, this power to state inferences based on expert knowledge is under strict control by the Daubert standard established in *Daubert*.⁵²⁵ In *Kumho*⁵²⁶ it was established that Daubert also applies to testimony based on “technical” and “other specialized knowledge”. The court stated in *Daubert* that, before an expert testimony is accepted as admissible, the court must make

*a preliminary assessment of whether the reasoning or methodology underlying the testimony is scientifically valid and of whether that reasoning or methodology properly can be applied to the facts in issue.*⁵²⁷

For acceptance, the

*overarching subject is the scientific validity--and thus the evidentiary relevance and reliability--of the principles that underlie a proposed submission. The focus, of course, must be solely on principles and methodology, not on the conclusions that they generate.*⁵²⁸

The court refused to give any definitive checklist or test to accept an expert opinion but provided some general factors for the court to consider. These are

1. “whether a theory or technique is scientific knowledge that will assist the trier of fact will be whether it can be (and has been) tested”. In this context, the court referred to the philosophy of science literature stating that “[s]cientific methodology today is based on generating hypotheses and testing them to see if they can be falsified”;
2. “whether the theory or technique has been subjected to peer review and publication”;
3. “in the case of a particular scientific technique, the court ordinarily should consider the known or potential rate of error”;
4. finally, the court stated that “general acceptance” can yet have a bearing on the inquiry. A “reliability assessment does not require, although it does permit, explicit

⁵²⁴ Federal Rules of Evidence rules 701 and 702.

⁵²⁵ *Daubert v. Merrell Dow Pharmaceuticals, Inc.* 509 U.S. 579 (1993).

⁵²⁶ *Kumho Tire Co. v. Carmichael* 526 U.S. 137.

⁵²⁷ *Daubert v. Merrell Dow Pharmaceuticals, Inc.* 509 U.S. 579 (1993).

⁵²⁸ *Daubert v. Merrell Dow Pharmaceuticals, Inc.* 509 U.S. 579 (1993).

identification of a relevant scientific community and an express determination of a particular degree of acceptance within that community."[...]."

Thus, the court requires relevance and reliability for expert evidence to be accepted as valid. Important factors in this context are the testability of the theory or technique, peer review and publication of the theory or technique, the potential rate of error if a particular technique is used, and the general acceptance of the theory or technique. Daubert refers to the science concept established by the philosopher of science Karl Popper.⁵²⁹ Popper stressed the possibility of falsification as imperative in determining whether something qualifies as science. The Daubert standard is now partially implemented in Federal Rules of Evidence, Rule 702.

Thus, the Daubert standard provides some restriction on the de facto power of experts to determine the facts.⁵³⁰ They must be experts of "real" science and not junk science. A justification is that it prevents decision makers, in particular, laymen jurors, being confused and giving weight to meritless expert testimony. Another justification for this screening is cost considerations, as it saves the costs associated with presenting meritless expert testimony. However, as the process surrounding a *Daubert* decision in many cases becomes quite extensive, it can be questioned how big these cost savings really are.⁵³¹

The admissibility of expert evidence is not so strictly regulated in the enforcement by the European Commission and the associated judicial review as in the US. One explanation for this is that the professional decision makers in the EU Commission and the EU courts are better suited to distinguish junk science from science compared to the laymen jurors used in US jury trials. When it comes to the European Courts the use of court appointed experts makes the need for a special formal screening like the Daubert standard less relevant, as the court have control over the qualifications of the experts appointed. Still, there are steps taken to secure the scientific level in the use of economic expert evidence in the EU. As mentioned above, the Commission employs academic-level economists in the chief economist team. Furthermore, the Commission has produced best practices on the submission of economic evidence.⁵³² These best practices are supposed to facilitate good methodology in the use of economics in evidence assessment. Furthermore, the courts seem to have been well suited, at

⁵²⁹ Popper (1959).

⁵³⁰ The Daubert screening of testimony based on economic models will be discussed further in Chapter Six.

⁵³¹ See Werden (2008).

⁵³² DG Competition, Best Practices For The Submission of Economic Evidence and Data Collection in Cases Concerning the Application of Articles 101 And 102 TFEU and in Merger Cases, Staff Working Paper.

least in some cases, to challenge the European Commission if the Commission has not based its analysis on sound economic methodology. An example of that is the above-mentioned *Airtours*⁵³³ decision.⁵³⁴

Despite strict requirements validity, there is still room for experts to exercise de facto power in determining the facts. Though the standards prevent experts going outside the borders of established science, there is still room for discretion by the experts on what models to use and which methods to rely on. The question is, then, if the procedural principles are arranged in a way that they prevent experts from exercising this power in conflict with rational evidence assessment.

Possible biases in the appeal to expert knowledge

As just described, experts have some discretion within the Daubert standard. They can use discretion on what models to use and what methods to rely on. In this section some factors that may bias inferences based on expert knowledge in antitrust evidence assessment are presented. How this more precisely can be implemented will be discussed further in Chapter Six.⁵³⁵

The first apparent bias in the utilization of experts in antitrust evidence assessment is the selection problem (adverse selection). The parties in an antitrust case do not randomly select the experts to support them. Experts themselves are not free from personal points of view. Some are likely to be pro-plaintiff, and some are likely to be pro-defendant.⁵³⁶ A party would like to have an expert who speaks for his case. Thus, in an adversarial process, experts that are systematically pro-defendant and pro-plaintiff as a matter of professional opinion are likely to be involved. It is also likely to be a selection bias regarding experts who are hired on a regular basis in inquisitorial enforcement authorities, such as those who are hired in the chief economist team in the European Commission. Some economists are typically pro-interventionist, while others are more skeptical to antitrust interventions. The European Commission is not likely to hire someone who is very non-interventionist. Such persons are not likely to have a strong desire to work there, either.

Furthermore, it cannot be ignored that the experts get paid by the parties they witness for. Ethical standards will prevent too strong economic incentives in the outcome of the

⁵³³ *Airtours plc v Commission of the European Communities* Case T-342/99 [2002].

⁵³⁴ See Geradin and Petit (2010). The courts seem to have been keener to review the economic methodology applied by the commission in cooperation and merger cases, but not in abuse of dominance cases.

⁵³⁵ See also Lianos (2010).

⁵³⁶ See Posner (1999) and Schinkel (2008).

case.⁵³⁷ Still, it would not be good for the expert's career to witness against his own client. Thus, experts might be argued to be "hired guns", arguing for their client's case regardless of professional opinion. A counterargument to this argument is that experts are repeat players.⁵³⁸ This mitigates the biases from a desire to satisfy clients. If an expert becomes known to argue for anything at the cost of professionalism, this will reduce the credibility of the expert, which would reduce the demand for the expert and reduce the price that can be charged by the expert. Experts will regularly be met with previous statements and previous academic research. If their statement is inconsistent with such previous material, this will reduce their credibility. This reduces the potential for experts to credibly argue for anything at any time. Furthermore, lack of professionalism in an expert witness may also be destructive for the expert's academic career.⁵³⁹

In an adversarial procedure, the biases from the selection effects and the possible incentives to satisfy clients may be balanced by having biased experts on each side. Thus, if the decision maker hears the opinion of two biased experts on each side, this might be a substitute of a balanced opinion.⁵⁴⁰ It is probably not so easy, though. As will be argued further in Chapter Six, two biased opinions on each side will not necessarily qualify as one unbiased expert advice, because the sum of two biased analyses provide less information than the information of a neutral analysis. Furthermore, relying on competing experts on each side may lay the ground for rent-seeking biases. Hiring experts is costly and may favor the party with the deepest pockets. Due to the various failures associated with biases of experts in the adversarial procedure, Posner has suggested more use of court appointed experts.⁵⁴¹ Using court appointed experts does not eliminate biases, as court appointed experts may still be subject to professional biases and confirmation biases. However, the selection bias will at least be mitigated. The use of neutral experts will be discussed in more detail in Chapter Six.

When it comes to an inquisitorial process, as in the EU, where the experts are hired by the inquisitor, the potential for a balance resulting from biased experts representing both sides is more limited. However, the above mentioned procedural reforms in the EU and the best practices on the submission of economic evidence are meant to create more balance between the European Commission and the experts representing the parties in a decision. However,

⁵³⁷ See Posner (1999) and Schinkel (2008).

⁵³⁸ Posner (1999) and Posner (2011) p. 837.

⁵³⁹ Schinkel (2008).

⁵⁴⁰ See Froeb and Kobayashi (1996). These will we explored further in the economic modeling of evidence assessment below.

⁵⁴¹ See Posner (1999, 1999b).

experts employed on regular terms by inquisitorial authorities, such as the European Commission, may be subject to confirmation biases, just as other employees. This may not make the particular suitable to neutrally assess the arguments that appear during the contradiction. This issue will be explored further in Chapter Six.

Another issue that has been pointed out in the literature, in particular when expert evidence is presented to a laymen jury, is that the rhetorical skills of an expert, rather than the scientific merits of the opinion, may be more determining for the weight given to the expert opinion.⁵⁴² Thus, the experts who influence the decision makers most are not the ones presenting arguments with most merits, but the best rhetoricians. This is an argument for reconsidering the use of jury trials in antitrust cases that regularly involve expert opinions on complex economic evidence.⁵⁴³ A problem with this is that replacing the juries with too professional decision makers is that then the decision makers will be experts themselves, who may be vulnerable to professional biases. An intermediate solution would be to use normal judges as evidence decision makers, not experts in antitrust economics, but experts in revealing, filtering, and balancing biases. Various instruments to reduce the impact of biased experts will be discussed further in Chapter Six.

A last point to make, though a full discussion is beyond the scope for this study, is possible biases associated with using the principles in Popper (1959) as a standard for what science is considered admissible as legal evidence. It will bias the experts' opinions to the established paradigm of the science in question and towards theories that use quantifiable measures that can be tested empirically.⁵⁴⁴ It can be argued that the courts are not the place to develop science, though. This issue in the context of economic science is revisited in Chapter Six.

Most of the possible biases discussed above are not systematic and will not necessarily favor either a finding of violation or not violation. They will just reduce some of the improved accuracy the use of experts is supposed to give. There are a few exceptions. It seems like expert biases due to selection biases and confirmation biases may systematically favor finding violation in inquisitorial expert organs like the European Commission. On the contrary, in the adversarial system, rent-seeking biases might be exaggerated by the possibilities of the parties

⁵⁴² See Hovenkamp (2005b) p. 80 and Posner (1999).

⁵⁴³ See Hovenkamp (2005b) p. 80 f. Posner (1999) is more positive to the use of juries.

⁵⁴⁴ This can be illustrated by an example outside antitrust. According to the current paradigm of drug testing, experiments testing the effects of drugs involve two test groups where the test subjects are picked by random selection. The test subjects do not know if they get the real medicine or placebo. The reason is to find the genuine effect of the medicine. This testing principle provides a disadvantage for developers of drugs who claim that it is the drug together with the psychological impact that gives it its full effect.

to dig into their deep pockets to create an imbalance in the presentation of expert opinions. A result of this might be that experts might be instruments for strong interests, such as large firms benefiting from monopoly-rents, creating a bias toward findings of not violation.

5.3.7 The impact of rhetoric and abuse of rhetoric

Argumentation is an inherent part of the legal process. By the use of argument, the players involved in the legal process can communicate suggestions for inferences of the evidence to the decision makers. With rhetorical skills, the players can try to convince the decision maker what the best explanation of evidence is and, eventually, what other plausible explanations there are. Thus, the study of actual decision making in antitrust would be incomplete without some discussion on the impact of rhetoric on the actual evidence assessment. This will be provided in this subchapter.⁵⁴⁵

Use and abuse of rhetoric principles in evidence assessment

Rhetoric is about using arguments to convince and persuade another person or a third party. The study of rhetoric and methods of persuasion can be traced back to ancient Greece, with Aristotle as a seminal contributor. Early philosophers and famous rhetoric masters like Cicero have discussed the principles for good and bad argumentation and how rhetoric skills can be used and abused in the art of persuasion.⁵⁴⁶ More recently, Walton (2002)⁵⁴⁷ gives the following ideal requirements to characterize the correct use of rhetoric:

- (R₁): The respondent accepts the premises as commitments.
- (R₂): Each inference in the chain of argument is structurally correct.
- (R₃): The chain of argumentation must have the proponent's thesis as its ultimate conclusion.
- (R₄): Arguments meeting (R₁)–(R₃) are the only means that count as fulfilling the proponent's goal in the dialogue.

⁵⁴⁵ Here, the influence of verbal argumentation and rhetoric on the evidence assessment is discussed. As a practicing lawyer, the author has been on several seminars and lectures that address non-verbal “procedural techniques” to influence the decision makers. This involves such things as making artificial breaks in the argumentations at the right time, when to repeat what a witness just said, and so on. These techniques are probably valuable experiences from experienced lawyers in the art of “lawyering” that have some merits. However, these techniques would probably not survive a Daubert challenge to use a familiar term. Thus, the impact of such techniques will not be discussed here.

⁵⁴⁶ See Graver (2008).

⁵⁴⁷ Walton (2002) chapter 7.

The master rhetorician will be one who, on the basis of premises accepted by the respondent, manages to convince the respondent as to the validity of the thesis it is argued for with valid methods of reasoning. The master in abuse of rhetoric will be able to convince anyone about almost anything by violating the requirements for correct rhetoric. If some argument violates the principles above it will be an abuse of rhetoric. Abuse of rhetoric in evidence assessment can most easily be illustrated by discussing how each of the requirements above may be violated. All the requirements may potentially be violated.

(R₁) is violated if an argument is based on premises the respondent does not share. The respondent in this context is the antitrust decision maker. If an argument is based on premises not accepted by the respondent, there is no value to the argument. Then it must first be argued for the premise itself. A typical wrong premise would be an argument based on a premise such as “if you like coffee, then you don’t like milk”. Evidence that you like coffee would then be presented as evidence supporting that you don’t like milk. This would not be valid however, because the premise is false. An antitrust example would be to build the argument on the premise that if some person did not have any intent to restrict competition by an action, then competition cannot be restricted by that action, when the decision maker does not accept such a premise. The presentation of evidence will not be very constructive for the decision maker if the parties involved argue on premises not accepted by the decision maker.

The implementation of the rhetorical abuse is to base argument on false and concealed premises to confuse the decision maker to think that an argument is better than it is. In antitrust, this may be particularly relevant when economic models are used to aid the argumentation, eventually with the aid of economic experts. Economic models consist of various implicit and explicit assumptions. This will be discussed further in Chapter Six, which will also include illustrative examples. It will be particularly confusing when the parties use different economic models based on different assumptions and it is not transparent for the decision maker as to what assumptions are used and which assumptions that are common or different in the economic models used. In the end, it might not be the merits of the economic model used that determines the probative force associated with the model, but the rhetorical skills of the one that presents it.⁵⁴⁸

(R₂) means that the one who argue only uses valid methods to infer from the evidence to the hypothesis. This means that the inferences must satisfy the principles of deduction and

⁵⁴⁸ See Hovenkamp (2005b) p. 80 and Posner (1999).

induction.⁵⁴⁹ A typical non-valid method of deduction is antithesis. If A causes B, this does not mean that if A is not present then B is not present. An antitrust example is that a lack of price correlation has contradictory probative force for the hypothesis that two products are in the same relevant market. However, a finding of price correlation has much less probative force for the hypothesis that two products are in the same relevant market. Thus, persuading the decision maker by the use of an antithesis argument to believe that price correlation has strong probative force for the hypothesis that two products are in the same market would be a violation of (R₂).

Valid methods of induction means that the principles of probative force explained in the subchapter on rational evidence assessment must be followed. More precisely, probative force must be assessed according to the laws of probability calculus. Abuse of rhetoric in this context would be to persuade the decision maker to assess evidence contrary to the laws of probability. In doing so, the abusive rhetorician can exploit the whole specter of imperfections and biases that influence the decision makers' actual assessment of evidence, as described above. The rhetorician can try to exploit cognitive biases by presenting evidence in the wrong way.⁵⁵⁰ The rhetorician may exploit the base rate fallacy and the conjunction fallacy. The rhetorician may exploit hindsight biases and the self-serving bias, the last one by presenting a more lovely alternative explanation of the evidence. The rhetorician might present strongly correlated evidence as independent evidence, hoping that the decision maker will be persuaded by the quantity of evidence rather than the quality of evidence. The rhetorician may use not-merit analogies and present experts that themselves are biased and masters in the abuse of rhetoric. The opportunities are limitless for rhetoricians to persuade decision makers as long as the decision makers do not see through the use of invalid methods of inference argued for.

Most are familiar with violation of (R₃) in arguments. Most have probably experienced attempts to be persuaded on something that they agree upon as an argument for another conclusion. In political debates, this is particularly revealing. Most people agree that good health care is important. It is, therefore, not very relevant to discuss whether or not good health care is important as such, when the real argument is whether healthcare should be

⁵⁴⁹ Even if the inferences are done by other means than applying deductive and inductive reasoning directly such as the use of for instance analogy, the inference must be as if it was done directly by deductive or inductive reasoning.

⁵⁵⁰ Framing effects is a source of a cognitive bias itself. Research has revealed that people may make different decisions in the same factual situation when they are presented with the same fact differently framed; see Farnsworth (2007) p. 224 f.

provided by public or private enterprises. Violation of (R₃) is practical in antitrust evidence assessment. The argumentation may shift from argumentation on the merits of the case to the credibility of some expert or the validity of the use of some statistical method with minor importance of the case. In antitrust, the correct topic for the evidence assessment might easily be confused by irrelevant topics. If the relevant question is whether some alleged anticompetitive conduct promotes or discourages innovation, there is no point defending the action by arguing for all the benefits of innovation. First, it must be determined whether the conduct actually promotes innovation or not.

As rhetoric is used to persuade a decision maker, it is apparent risk of the abuse of rhetoric in an adversarial trial. The adversarial procedure provides an arena for masters in rhetoric, and masters in the abuse of rhetoric. A decision maker does not need to use rhetoric to persuade himself in an inquisitorial process. Still, an inquisitor may be challenged in judicial review, and is subject to scrutiny by the community. Thus, the abuse of rhetoric may be a valuable instrument for an inquisitor. Furthermore, when parties exercise their contradictory right, rhetorical skills and skills in the abuse of rhetoric may influence the inquisitorial decision maker. Thus, the inquisitorial process is not free from the abuse of rhetoric. In an adversarial procedure, there will be an opposing party to reveal and rebut the abuse of rhetoric by the other party. Thus, abuse of rhetoric must have a certain level of sophistication. The risk of non-merit influence due to the abuse of rhetoric is probably bigger in jury trials than when professional decision makers assess evidence. Professional decision makers are more likely to be able to distinguish meritorious arguments from abuse of rhetoric. The particular importance of abuse of rhetoric associated with economic expert evidence is discussed further in Chapter Six, which will also include examples.

Narratives

A successful rhetorical method of persuasion in the context of legal assessment of evidence has been claimed to be a matter of providing the most convincing narrative (story) consistent with the evidence.⁵⁵¹ If the standard of proof is balance of probabilities, this is a matter of presenting the most plausible narrative. If the standard of proof is beyond reasonable doubt, the job of the prosecution is to present a narrative that there is no reasonable reason to doubt. For the defendant, the challenge is to come up with a narrative plausible enough to establish reasonable doubt.

⁵⁵¹ See Anderson et al. (2005) p. 150 f. See also Kolflaath (2007).

In a narrative approach, the evidence is merged with the hypothesis to create a holistic story explaining the evidence. A relevant question is whether there are more biases associated with relying on the most plausible narrative consistent with evidence than to assess evidence by hypothesis-testing. It can, at least, be argued that the use of narratives creates some additional opportunities to exploit cognitive biases to obtain an assessment that deviates from a rational assessment of evidence.⁵⁵² The conjunction fallacy is an obvious cognitive bias that can be exploited in a narrative. A more detailed story might be perceived as more likely, even if the details involve assumptions that are not proved. Assume that the prosecutor wants to provide a more convincing case for a price conspiracy, and states that “the companies A and B wanted to increase their margins and saw the opportunity to achieve this by a price conspiracy”. A general desire to increase profits has hardly any probative force in support for a price conspiracy, but might still seem more convincing than “company A and B entered into a price conspiracy”. The supplementing statement provides an explanation that makes us believe the story more.

Adding more detail might also have another biasing effect. If a story is very detailed, it might be perceived as unlikely that such a level of detail can be produced by pure imagination. Thus, a story can be made more convincing by adding detail.

Using narratives also makes it possible to exploit the biases towards more lovely explanations that are objectively less likely.⁵⁵³ People might like better a story where the management of national firms join together to establish a strategy to fight ruthless foreign competition rather than coming together to fix prices. A narrative might include such undocumented details. The result is that probative irrelevant “story-fill” might affect the evidence assessment.

The human brain memorizes in terms of associations. Observations are interpreted in light of the person’s experiences. Details that appeal to the right associations and experiences can be added to a narrative to make it more convincing, even if the details have no objective probative force in favor of the hypothesis the narrative is supposed to support. In a story about price fixers, it can be added to the story that the participants met in “dark rainy evenings” to trigger associations to the disguising of shady activities. Whether it was dark and rainy the evenings they met might have little probative force as such. It might be relevant if there were actions taken to cover up the activities, but then this should be addressed directly if there is

⁵⁵² See Anderson et al. (2005) p. 280 f., discusses some fallacies associated with the use of narratives in the evidence assessment.

⁵⁵³ Lipton (2004) p. 142 f and Kolflaath (2007).

evidence of such a cover up. Narratives facilitate the use of other linguistic manipulation techniques in addition to the one just mentioned. Words that trigger associations to something positive or negative can be repeated to reinforce their effect. For instance, the title and merits of some expert might be repeated every time his name is mentioned to reinforce the credibility status of the expert. It will be outside the scope of this study to go further into such techniques.

As with the abuse of rhetoric in general, there is a risk of biases towards the party who performs best in creating a narrative rather than the one with the most meritorious case. This risk is probably larger in an adversarial procedure with a jury than in a process with professional decision makers.

5.3.8 Some comments

In this subchapter it was discussed how antitrust evidence assessment is actually performed and how this evidence assessment might deviate from rational evidence assessment. It was found that abductive reasoning is descriptive for actual antitrust evidence assessment in both the US and EU. Furthermore, both the EU and US systems, despite their differences, contains instruments of sequential decision-making, which in theory, makes it possible to implement rational sequential decisions.

The likely imperfections and biases that are likely to create a divergence between actual and rational evidence assessment were analyzed. Institutional and cognitive biases are likely to influence the actual evidence assessment both in the US and EU. Important principles of abductive reasoning, such as analogical reasoning and appeal to expert opinion, are valuable informal methods of actual evidence assessment. However, the use of these methods also involves a risk of erroneous and biased decisions. Furthermore, there is a risk that rhetorical skills may trump the merits of the case.

It was found that most of the imperfections and biases are not likely to affect evidence assessment to systematically favor violation or not violation. This means that they might bias the evidence assessment in a single decision, but not systematically favor violation or not violation. Many of these imperfections and biases are more likely to influence laymen jury decisions than professional decision makers as professional decision makers are more likely to be aware of, discover, and correct for the biases. Cognitive biases are likely to be well known to many professional antitrust decision makers. Furthermore, professional decision makers are likely to be aware of the risk of biased experts and are likely be better trained to avoid being persuaded by the abuse of rhetoric. Thus, many biases may be mitigated by

having more professional decision makers. This mitigation can be achieved either by abandoning the laymen jury or by making judges more active in the case administration. With more active case administration, the judges can prevent that the jury becoming biased by non-meritorious factors. However, there is a fine balance between such involvement the judge unduly influencing the jury.

More professional decision makers are also associated with some problems. Professional decision makers may be subject to a bias towards priors generated by experience. The professional decision makers may be inclined to be biased towards these priors both because of the confirmation bias and because this will save assessment costs. If the decision maker is “too professional” in terms of being an antitrust expert himself, he might be subject to professional biases. A beneficial middle way might be to have professional, but not too professional, decisions makers. Generalist judges might offer such a middle way.

With the basis in existing research, some sources of imperfections and biases that are likely to systematically bias the decisions towards violation were found. It was found that inquisitorial decision makers such as the European Commission are likely to be subject to a prosecutorial bias that will favor violation findings. The prosecutorial bias is a bias resulting from both incentive biases and cognitive biases.

Some sources of imperfections and biases that might systematically favor findings of non-violations were also identified. As antitrust defendants often represent strong interests who want to protect monopoly profits. Rent-seeking from such interests may affect the decisions in the direction of not violation. This is of particular relevance for the complex antitrust violations involving testimony of experts. Rent-seeking can then be obtained by hiring high-profile economist experts in large numbers. Furthermore, the best lawyers and a team of rhetorical masters can be employed to achieve the desired results. The adversarial process is a playing field for such influence, which makes the adversarial system a better arena for such rent seeking. Jury trials probably extend the potential for exploiting this playing field.

Some questions are now raised and some preliminary recommendations are provided. In the next subchapter these questions and preliminary recommendations will be informed further with an economic model of actual evidence assessment.

5.4 Modeling actual evidence assessment in antitrust

5.4.1 Modeling actual evidence assessment

In the last subchapter informal reasoning was used to address the rationality of actual antitrust evidence assessment. The actual method used by antitrust decision makers to assess evidence was identified as abductive reasoning and it was discussed how potential imperfections and biases may distort the evidence assessment away from a rational evidence assessment. Insights from various disciplines were used. In this subchapter the performance of actual antitrust evidence assessment will be informed further by economic modeling. Legal evidence assessment and the impact of the procedural framework on the performance of the evidence assessment have been studied with economic models in the field of law and economics.⁵⁵⁴ These modeling efforts will be returned to throughout the discussion.

Game theory is a central modeling tool in the economic models of actual evidence assessment. Game theory is a model framework for studying strategic interaction by optimizing agents. There is a debate on the capability of game theory to explain and predict strategic interaction. The title “*The bounds of Reason: Game theory and the Unification of the Behavioural Sciences*” of Gintis (2009) illustrates an optimistic view of game theory as a general modeling framework for optimizing interaction. However, statements like, “[t]his destines game theory to a fascinating footnote in some future text on the history of social theory,”⁵⁵⁵ are less optimistic. Game theory happens to be one of the main components of the models economists use to study competition in markets, and serves as a theoretical framework for many models crucial to antitrust analysis. Thus, a principled discussion of the informative value of game theory models will be provided in Chapter Six.

5.4.2 A model of actual evidence assessment in antitrust

A relatively simple model will be used as a basis to analyze actual evidence assessment. To easily compare actual evidence assessment with rational evidence assessment the same basic framework that was used to study rational evidence assessment above will be used. The model shares some similarities with existing models, but is of more a general character than models that address particular topics.

⁵⁵⁴ Posner (1999) is a seminal contribution. Dewatripont and Tirole (1999) study the competition between advocates in general. Evidence competition in legal procedure is a special case. Spier (2007), Sanchirico (2007), Sanchirico (2012), and Froeb and Kobayashi (2012) give surveys on the law and economics literature on the topic. Parisi (2002) uses a model based on a continuous scale between inquisitorial and the adversarial process. See also Neven (2006), and Posner (2011), Chapter 22.

⁵⁵⁵ See Hargreaves-Heap and Varoufakis (2004) p. 122.

Assume for now that there is one judge (or juror) that will decide violation or not violation based on evidence e . The complications that follow from many judges or jurors that must somehow consent will be addressed below. Let H_V be the hypothesis that there was a violation. Let e be the evidence available and $p^J(H_V|e)$ be the judge's subjective probability assessment that there was a violation given evidence e . Furthermore, assume, as a starting point, that the judge is rational in the sense that he will maximize his own expected utility. Let $U^J_{V,V}$ be the judge's utility of deciding violation given that there was a violation, $U^J_{V,NV}$ is the utility of deciding violation when there was no violation, $U^J_{NV,NV}$ is the utility of deciding not violation when there was no violation. Finally, $U^J_{NV,V}$ is the utility of deciding not violation if there was a violation. It will be rational for the judge to decide violation if the expected utility of deciding violation is larger than the expected utility of deciding not violation. That is, if

$$p^J(H_V|e)U^J_{V,V} + (1-p^J(H_V|e))U^J_{V,NV} > p^J(H_V|e)U^J_{NV,V} + (1-p^J(H_V|e))U^J_{NV,NV},$$

which is the same as

$$(1-p^J(H_V|e))[U^J_{NV,NV} - U^J_{V,NV}] < p^J(H_V|e)[U^J_{V,V} - U^J_{NV,V}].$$

By transforming this expected utility maximization into expected loss minimization, as described in Chapter Four, we get

$L^J_V = [U^J_{NV,NV} - U^J_{V,NV}]$ is the judge's loss of wrongfully deciding violation (type-1 error)

$L^J_{NV} = [U^J_{NV,NV} - U^J_{V,NV}]$ is the judge's loss of wrongfully deciding not violation (type-2 error)

Thus, it will be rational for the judge to decide violation if the expected loss of deciding violation is less than the expected loss of deciding not violation, and rational to decide not violation otherwise. This means deciding violation if

$$EL^J_V(e) < EL^J_{NV}(e),$$

where

$$EL^J_V = (1-p^J(H_V|e))L^J_V \text{ and } EL^J_{NV} = p^J(H_V|e)L^J_{NV}.$$

Evidence assessment, including gathering evidence, also includes costs. As in the framework for rational evidence assessment, assume that \bar{E}^{tot} is the potential amount of evidence that can be gathered. \bar{E} is the evidence gathered, and e is the actual outcome of \bar{E} . Assume that the judge's cost of assessing evidence is $c^J(\bar{E})$, and that this cost is known a priori.⁵⁵⁶

The expected a priori loss, which means before we know e , of a rational decision including decisions on collecting evidence can then be written as:

$$\text{Min}_{\bar{E}} E_{\bar{E}}(EL^J(\bar{E})+c^J(\bar{E})).$$

Since $EL^J(\bar{E})$ is equal to $\min[1-p^J(H_V|\bar{E})L^J_V, p^J(H_V|\bar{E})L^J_{NV}]$ this becomes

$$\text{Min}_{\bar{E}} E_{\bar{E}}(\min[(1-p^J(H_V|\bar{E}))L^J_V, p^J(H_V|\bar{E})L^J_{NV}]+c^J(\bar{E})).$$

There are two minimization operations for the judge. Given that some evidence, e , is gathered, the rational judge will minimize expected loss. However, before the judge knows the outcome, he has to “average” over all possible outcome of \bar{E} by taking the expectation when he is deciding to gather the evidence or not. This is the $E_{\bar{E}}$ part. The $\text{Min}_{\bar{E}}$ refers to that the judge optimize the evidence gathering with regard to both the amount and sequence, taking the cost of gathering evidence into account.

The model framework for actual evidence assessment just presented can be compared to the framework for rational evidence assessment outlined above. All the elements of the decision problem are the same, except that the objective measures of probabilities, losses of errors, and costs are replaced with the corresponding subjective measures of the judge. The judge's decision will correspond to the objective rational decision if the judge's probability assessment corresponds with the objective probability assessment, which means that $p^J(H_V|e)=p(H_V|e)$, if the judge's measures of losses from errors correspond with the objective measures of these losses, which means that $L^J_V=L_V$ and $L^J_{NV}=L_{NV}$. And, if the judge's cost assessment corresponds with the social costs of assessing evidence, this that $c^J(\bar{E})=c(\bar{E})$. If there is no such correspondence, the rational evidence assessment of the judge is likely to deviate from the objective rational evidence assessment, except for by pure coincidence.

⁵⁵⁶ In theory we could assume that there was some uncertainty associated with the costs, and then operate with expected values. This is a complication that will not be pursued in this study.

There might be many reasons that the judge's probability assessments, loss assessments, and cost assessments might deviate from the objective ones. When it comes to probability assessments, the judge might have different priors than the objective correct priors.⁵⁵⁷ The judge might be subject to imperfections and biases in the assessment of evidence as described in the previous subchapter. Furthermore, there might be many reasons why a judge's loss assessments might deviate from the objective one. A judge's utility might be distorted by institutional biases such as political pressure, budgets contingencies, career opportunities, salary, and other factors, as described above. Finally, a judge's cost assessment will be influenced by his own personal costs of assessing evidence, which may not correspond to the social costs.

The insight on imperfection and biases discussed informally in the previous subchapter will be used to inform the various components of the model. Thus, the interesting question for the present modeling efforts is whether the model can provide some additional insight on actual evidence assessment than what resulted from the informal discussion above.

Since a judge's probability assessments, loss assessments, and cost assessments are likely to depend on whether the system is inquisitorial or adversarial, the model is further discussed separately under the two systems. These two kinds of processes are discussed as a dichotomy, though the possibility of a sliding scale between the two types of procedure is noted.⁵⁵⁸ The inquisitorial system is used as a benchmark for the EU, while the adversarial system will be used as a benchmark for US antitrust procedure. Note, however, that with contradictory rights for the parties during the procedure and the possibility of judicial review, the EU system includes adversarial elements. In the US, the courts have the possibility to gate-keep the presentation of evidence, and to make sequential decisions as described above. Thus, there are some inquisitorial elements within the US adversarial procedure.

5.4.3 Modeling evidence assessment in an inquisitorial process

Assume now that the system is inquisitorial. The judge has the responsibility of gathering evidence, and later decides violation or not violation based on the evidence gathered.

The judge will weigh the reduction in his subjective expected loss from error by gathering more evidence against his subjective costs of gathering more evidence. In the terms used above, the judge will weigh his personal decision value against his personal costs of

⁵⁵⁷ This is a point stressed by Posner (2008) p. 65 f.

⁵⁵⁸ Parisi (2002) uses a model with a continuous sliding scale between the adversarial and inquisitorial procedure. This model will be returned to below.

gathering more evidence. The judge's decision value of gathering more evidence depends on the judge's personal probability assessment and the subjective losses of making errors.

As described above, one source of systematic probability assessment bias in an inquisitorial procedure is the confirmation bias.⁵⁵⁹ This means that $p^J(H_V|e)$ is likely to become larger than the true $p(H_V|e)$. This increases the probability of a wrongful decision in the direction of finding violation. This wrongful assessment of $p(H_V|e)$ will also distort the judge's assessment of the decision value of evidence that can be gathered. If new evidence that can be gathered is underestimated to have probative force in the direction of not violation, it is less likely to be gathered. Thus, it is likely that an insufficient amount of evidence contradictory to violation will be gathered.⁵⁶⁰

The inquisitor's loss of errors depends on the incentive structure of the inquisitor. This can create biases. The inquisitor may favor certain interest groups due to political biases. As discussed above, it is likely that an inquisitor is rewarded more for visible action and has an incentive bias in favor of finding violations. Thus, the inquisitor's utility of finding violation relative to finding not violation is likely to be larger than the objective relationship. This means that the inquisitor will assess the loss of type-2 errors (not finding violation when there was a violation) relative to the loss of type-1 errors (finding violation when there was no violation) as larger than the objective assessment of this relative loss. This has several effects. It will increase the subjective decision value of evidence that is likely to have probative force supporting violation, which may lead to an excessive search for such evidence. Thus, a preference for avoiding type-2 errors might lead to too much evidence gathered in the "hope" of finding evidence that may switch the decision from not violation to violation. This is dangerous in combination with the confirmation bias, because the assessment of probative force of any evidence found will be biased towards violation. The value of evidence with probative force in favor of violation will be exaggerated, and the probative force of contradictory evidence will be underestimated. Furthermore, the standard of proof applied by the decision maker will be too low as long as the decision maker has some flexibility in the standard of proof applied. The too low standard of proof applied will lead to findings of violation when not violation is the objective rational decision.

⁵⁵⁹ See Wils (2003) and Gerdin and Petit (2010).

⁵⁶⁰ Note that a confirmation bias might also work in the opposite direction. If the inquisitor should have as their initial opinion that some conduct is not a violation, then $p(H_{NV}|e)$ is likely to be overestimated. In addition to the direct effect this has on a wrongful decision, it will discourage gathering evidence in favor of violation.

The inquisitor's costs will be the costs the inquisitor experiences as his own costs associated with gathering evidence. This might include both personal efforts and the alternative cost due to the use of budget that alternatively might be used for other purposes. The inquisitor is not likely to take into account costs only born by others. This means, for instance, that he will not properly take into account the cost imposed on the investigated party to produce evidence. Thus, it might be desirable for the inquisitor to inefficiently switch the burden of proof to the investigated party, even if this party has a higher cost in providing the evidence.⁵⁶¹ This means that $c^J(\bar{E})$ will be considered as lower for the judge than real cost $c(\bar{E})$ for evidence produced by the investigated party. This has several impacts on the evidence assessment. First of all, the procedure becomes inefficiently costly. Secondly, if the burden of proof becomes heavy enough, the investigated party will find it too costly to provide the evidence, even if it exists.⁵⁶² This is dangerous in combination with the confirmation bias as the inquisitor then will give this failure of providing evidence too high probative force in favor of violation. Thus, the inquisitor will give too high probative force in support of violation from the failure of the investigated party to provide evidence. Assume, for example, that the inquisitor is assessing a vertical agreement. He uses his power to impose a burden of the parties to provide evidence of the efficiencies of the agreement. Assume that this requires that the investigated party needs some information prohibitively costly to gather, but that could be gathered by the inquisitor at lower cost. When the investigated fails to produce this evidence, the inquisitor will allocate too high probative force of this failure to provide evidence of efficiencies in favor of violation. Thus, on the contrary to Shin (1998), it is considered here that too much probative force is likely to be given to the non-presence of some particular evidence in an inquisitorial process.⁵⁶³ This point is returned to when the adversarial and inquisitorial procedure are compared below.

Insight from the previous subchapter has now been used as input to the model of the inquisitorial procedure. The question is, then, whether this modeling effort has provided some additional insight on the inquisitorial procedure. The answer appears affirmative. The characteristic of an inquisitorial system are "fitted" to a model that makes it easy to compare the inquisitorial procedure with rational evidence assessment. This has allowed studying the

⁵⁶¹ Allowing the inquisitor to impose a burden of evidence production on the investigated party distinguishes the present model from many other economic models of inquisition such as Froeb and Kobayashi (1996).

⁵⁶² Then the presumptions will not work as signals as they are supposed to do, separating those who can provide the "truthful" evidence and those who must fabricate the evidence at a higher cost. See Sanchirico (2012) for a discussion, based on, *inter alia*, on Milgrom and Roberts (1986).

⁵⁶³ A central premise for this disagreement with Shin (1998) is that is the assumption that the inquisitor can impose a burden of the parties to produce evidence.

impact of these characteristics on the rationality of evidence assessment taking dynamical considerations into account. The confirmation bias and the incentive biases are not only likely to yield a wrong decision from a static perspective, but will also distort the entire evidence gathering procedure. In particular, too little evidence that might be contradictory to finding violation will be gathered, while too much evidence in favor of violation will be gathered. A too low standard of proof will be applied. When the costs are taken into account, the model reveals that the presumptions imposed on the parties will be too harsh and yield a too costly evidence gathering procedure. Finally, too much probative force is likely to be given to the non-presence of evidence that is left to the party to produce by presumptions. These topics will be discussed further when the adversarial and the inquisitorial procedure are compared below.

Finally, note that the impact of judicial review is not explicitly modeled. The judicial review will impose some limits on the impacts of the imperfections and biases associated with the inquisitorial procedure.⁵⁶⁴ The *Airtours*⁵⁶⁵ decision in the EU discussed above is an example of this. The impact of judicial review depends on the standard of review, as described in Chapter Two. Limits in the standard of review, such as the restricted standard of review in the assessment of complex economic evidence in the EU, leaves room for the imperfections and biases associated with the inquisitorial procedure in the EU. Furthermore, even when judicial review is possible, the burden to challenge the decision imposed on the parties creates room for inquisitorial imperfections and biases.

5.4.4 Modeling evidence assessment in an adversarial process

Let us now move to the adversarial system. The judge is now assumed to no longer have control over what evidence is gathered. The judge will find violation if

$$EL_V^J(e) < EL_{NV}^J(e),$$

where

$$EL_V^J = (1 - p^J(H_V|e))L_V^J \text{ and } EL_{NV}^J = p^J(H_V|e)L_{NV}^J.$$

⁵⁶⁴ See Geradin and Petit (2010) for a study on the impact of judicial review in EU competition enforcement.

⁵⁶⁵ *Airtours plc v Commission of the European Communities* Case T-342/99 [2002].

Thus, the judge will find violation if the expected personal loss of finding violation is less than the expected personal loss of finding not violation for whatever evidence, e , is presented in the court by the parties. Thus, in an adversarial procedure, the direct costs of gathering evidence are irrelevant for the judge's decision. This is consistent with the discussion above, which indicates that judges seem to pay too little consideration to costs in the evidence assessment. However, as discussed above, a judge has some costs associated with evidence. These are the costs of processing and assessing the presented evidence. The judge has an incentive to reduce those costs as described in the informal discussion above.⁵⁶⁶ This can be modeled as a bias in the assessment of $p^J(H_V|e)$, where too much weight is given to the a priori probability assessment $p^J(H_V)$. Since $p^J(H_V|e) = p^J(e|H_V)p^J(H_V)/p^J(e)$, this means that the judge will give too little weight to the information given by the evidence e . This is an argument for jury trials as juries are less experienced and will give more weight to the actual evidence in the case.⁵⁶⁷ However, the downside is, as discussed above, that jurors are more prone to biases as they are less experienced in handling biases and at revealing and filtering out biases. Furthermore, a juror will not have experience to form the same priors, and is likely to put more weight on $p(e|H_V)/p(e)$. Thus, jurors are more prone to the base rate fallacy, which is to ignore the informative value of priors.

When it comes to losses from errors, no good arguments were found that adversarial judges systematically prefer deciding violation to not violation. As mentioned above, independent judges might have biased preferences towards some interest groups due to the selection effect following from the preferences from the politicians who appoint them. Still, this preference bias could not be identified as systematically directed towards violation or not violation.⁵⁶⁸ Thus, it is likely that judges, as a starting point, are loyal to the given standard of proof that applies to the type of case in question. The standard of proof is supposed to reflect the assumed losses from errors of the type of case in question.

We will now move to the modeling of evidence gathering by the parties. Assume that there are two parties: plaintiff (P) and defendant (D). Furthermore, split the evidence into the evidence gathered by the plaintiff favoring violation e_P and the evidence gathered by the defendant favoring not violation e_D . This means $e = \{e_P, e_D\}$. Assume that it is in the plaintiff's interest to provide evidence that can be argued to have probative force in favor of violation,

⁵⁶⁶ See Posner (1999) and Posner (2011) p. 824 f.

⁵⁶⁷ Posner (1999).

⁵⁶⁸ Note that rent-seeking bias may favor monopoly rent-protection as a matter of opportunity and incentives to invest in rent-seeking. This is not the same as if the decision maker has a preference bias. Such rent-seeking biases will be discussed below.

while the defendant will provide evidence that can be argued to have probative force contradicting violation. Let $c^P(e_P)$ be the plaintiff's cost function and $c^D(e_D)$ be the defendant cost function associated with gathering and presenting the evidence. Both cost functions are increasing in the amount of evidence. Let U^P_V be the plaintiff's utility if violation is decided, and let U^P_{NV} be the plaintiff's utility if not violation is decided. Assume that $U^P_V > U^P_{NV}$. Similarly, let U^D_V and U^D_{NV} be the corresponding utilities for the defendant. Here we have $U^D_V < U^D_{NV}$. Furthermore, let $p^P_V(e_P, e_D)$ and $p^D_V(e_P, e_D)$ be the plaintiff's and defendant's perceived probability, respectively, for the judge to decide violation given evidence e_P and e_D . Assume that both p^P_V and p^D_V are increasing in e_P and decreasing in e_D . Furthermore, assume that the plaintiff and defendant either know the "truth" and thus the outcome of their own evidence gathering; alternatively, if the outcome of gathering evidence is unknown, only favorable outcomes will be presented in court. Fabricated or misleading evidence might be produced, but fabricating evidence involves both higher direct costs of production than if the same evidence was not fabricated and an additional indirect cost from the risk of sanctions associated with the presentation of fabricated evidence. It is natural to assume that arguing for the "truth" involves lower cost than arguing for some facts that contradict the underlying truth.⁵⁶⁹

The plaintiff will choose e_P so it maximizes its expected surplus from litigation. This means maximizing the following equation with respect to e_P :

$$ES^P(e_P) = p^P_V(e_P, e_D)U^P_V + (1 - p^P_V(e_P, e_D))U^P_{NV} - c^P(e_P).$$

Similarly, the defendant will maximize:

$$ES^D(e_P) = p^D_V(e_P, e_D)U^D_V + (1 - p^D_V(e_P, e_D))U^D_{NV} - c^D(e_D),$$

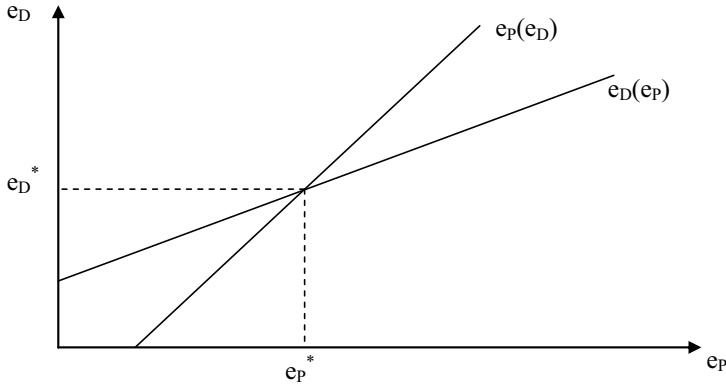
with respect to e_D .

The choice of evidence presented by the two parties can be modeled as a game. Each party optimizes its own amount of evidence, and the equilibrium amount of evidence is where no party has an incentive to change its amount of evidence given the other's amount of evidence.⁵⁷⁰ This is illustrated in Figure 5.3:

⁵⁶⁹ See Posner (2011) p. 830 for the same point.

⁵⁷⁰ This is the Nash-equilibrium. We will return to equilibrium concepts in game theory in Chapter Six.

Figure 5.3: equilibrium amount of evidence



In Figure 5.3, $e_P(e_D)$ and $e_D(e_P)$ are the reaction functions of the plaintiff and defendant, respectively. This is a function of how much evidence it is optimal to provide given the other party's amount of evidence. The equilibrium amounts are e_P^* and e_D^* . In the equilibrium, no party has an incentive to increase its amount of evidence given the other party's amount of evidence. The evidence process can be seen as a process where each party provides more and more evidence until equilibrium is reached. The evidence competition leads to an evidence race, facilitating too much evidence production as a result. Another way to see it is that a party's gathering of evidence imposes an externality on the other party by increasing the other party's value of gathering more evidence. This might result in overproduction.⁵⁷¹

The equilibrium amounts of evidence e_P^* and e_D^* are determined by

$$\partial ES^P(e_P^*)/\partial e_P^* = 0 \Leftrightarrow [\partial p_V^P(e_P^*, e_D^*)/\partial e_P^*](U_V^P - U_{NV}^P) = \partial c(e_P^*)/\partial e_P^*$$

and

$$\partial ES^D(e_D^*)/\partial e_D^* = 0 \Leftrightarrow [\partial p_V^D(e_P^*, e_D^*)/\partial e_D^*](U_V^D - U_{NV}^D) = \partial c(e_D^*)/\partial e_D^*$$

From these equations, we can see that the higher the stakes in the case, the more evidence it will be optimal for the parties to provide, everything else equal. If there is a correlation between objective losses of errors and the stakes in the case, this will be in correspondence with the rational benchmark, as the higher the losses of error are, the higher is the decision

⁵⁷¹ See Posner (1999), Spier (2007) and Sanchirico (2007).

value of more evidence that can influence the decision. However, if there are high personal stakes in the case, but low objective losses from error, the adversarial process may contribute to an overproduction of evidence.⁵⁷²

The adversarial process may result in duplicative evidence production. Assume that the plaintiff searches for some potential evidence that, dependent on the outcome, will have either probative force in support or in contradiction of a violation. Such evidence might, for instance, be an econometric analysis showing the degree of substitution between two products of merging parties in a merger investigation. If a high degree of substitution is found, it might support a violation, but low substitution might support a non-violation. Both parties might have an interest in performing this analysis, but only one have an incentive to present the result as evidence.⁵⁷³

How the evidence is believed to affect the probability of the decision is crucial for the parties' evidence decisions. For the plaintiff, the size of $\partial p_V^P(e_P, e_D)/\partial e_P$ is positive, and the more positive, the higher is the gain from gathering evidence. Conversely, for the defendant, $\partial p_V^D(e_P, e_D)/\partial e_D$ is negative, and the more negative, the higher is the gain from gathering evidence. Thus, the higher the marginal value of gathering evidence on the perceived probability assessment of the judge, the more evidence it is rational to gather. If the parties believe that the judge rationally assesses evidence according to the principle of probative force, this will motivate the parties to gather evidence in correspondence with rationality. However, there might be attempts to disguise or mislead the probative force, exploiting imperfections, cognitive biases, and abusive rhetoric as described in the previous subchapter. As described above, this may, in particular, be effective in jury trials.

Finally, the lower the marginal cost of producing evidence, the more evidence it is rational to gather. This means that if there are lower marginal costs associated with providing evidence for the truth, then this factor will contribute to more evidence in line with the truth.⁵⁷⁴

We have now used the insights from the informal discussion of actual evidence in antitrust analysis above as inputs to a model of the adversarial procedure. The question is, then, whether the model has provided some additional insight. The answer appears to be affirmative. First, the model has confirmed the critique described above that judges do not

⁵⁷² See Posner (1999) for a similar discussion.

⁵⁷³ The parties may be mandated to present analyses performed in a discovery procedure. We will for now not complicate the issue by taking this possibility into account.

⁵⁷⁴ See Sanchirico (2012). See also Farmer and Pecorino (2000) for the same point.

seem to take costs properly into account in their statements about evidence assessment. In the present model, this is because the judges do not have the proper incentives to take all costs into account as the costs are incurred by the parties. Furthermore, the evidence race predicts a too excessive amount of evidence and duplication efforts in the production of evidence. Thus, a plausible presumption is that an adversarial process will generate too much evidence gathering compared to rational evidence gathering. A consequence of this is that too high costs will be incurred on evidence gathering compared to the rational amount. Furthermore, the duplicative efforts will contribute to a too high cost level. An additional insight provided by the model above is that the amount of evidence gathered is heavily dependent on the stakes of the case. A divergence of the private stakes and the social stakes might contribute to either too much or too little evidence gathering. If the private stakes are higher than the social stakes, the evidence gathering is likely to be excessive. On the contrary, if private stakes are low, this will contribute to a too small amount of evidence gathering. If stakes are asymmetric it is likely to be an excessive amount of evidence in favor of the party with the higher stakes.

The model also reveals an additional insight. If a party involved thinks that the judge is biased, the party that is negatively impacted has an incentive to compensate for this with providing more evidence. The reason is that more evidence is necessary to tip the decision in the favored direction. This will mitigate the effects of biased judges in an adversarial trial.⁵⁷⁵ Assuming that the marginal costs of producing evidence for the underlying truth is lower than producing evidence for a desired fact not corresponding with the truth, there will be more evidence in favor of the truth, all else being equal. This will contribute to increased accuracy.

5.4.5 Comparing the inquisitorial and adversarial model outcomes

The model outcomes of both the inquisitorial and adversarial system are now analyzed. We can now compare their performances with rationality as an ideal standard. The various components of evidence assessment will first be compared. This will be followed by an overall assessment in the end.

Losses from errors

The first question is if the inquisitorial or the adversarial system performs best in aligning the decision makers' personal losses from errors with the objective losses from errors. In other words, the question is which system is most incentive-compatible with rationality. Based on the discussion above, an inquisitor is likely to have excessive incentives to avoid type-2 errors

⁵⁷⁵ See Froeb and Kobayashi (1996) and Farmer and Pecorino (2000) for a critique. See also Sanchrigo (2012).

(finding not violation when there was a violation). This will bias the evidence assessment towards finding violations. In an adversarial process, there is no reason to believe that the decision makers' have some systematic preferences for avoiding either type-1 errors or type-2 errors. It is likely that the standard of proof will guide the error assessments. Although the standard of proof is determined by the type of case in question and not the losses from errors in the specific case, this is an approximation of the true losses from errors. Thus, it is likely that systematic incentive biases constitute a larger risk for irrational evidence assessments in the inquisitorial procedure compared to the adversarial procedure. Since the inquisitorial procedure is more descriptive for the EU competition law procedure, while the US procedure is more of an adversarial procedure, there is a larger risk for systematic incentive biases in evidence assessment in the EU. The result is that evidence assessments in the EU are more likely to be biased in favor of finding violations.

Assessing probative force

The next question is which system performs best in yielding rational assessments of probative force of evidence according to the rules of probability. The question is, more precisely, in which system $p^J(H_V|e)$ is most likely to correspond with $p(H_V|e)$.

A confirmation bias towards finding violations is associated with the inquisitorial procedure. This means that it is likely that, when the inquisitorial decision maker has formed a belief that there was a violation, $p^J(H_V|e)$ is likely to be higher than $p(H_V|e)$.

When it comes to the adversarial procedure, the rationality of $p^J(H_V|e)$ is likely to depend on whether the decision maker is a judge or layman juror. To illustrate this, recall that $p^J(H_V|e) = p^J(H_V)p^J(e|H_V)/p^J(e)$. A judge who wants to save on his personal costs of processing the specific evidence of the case may rely too much on the prior probability $p^J(H_V)$ gained from experience with previous cases. The same may follow from a confirmation bias. This will result in path-dependence and a bias towards former similar cases he has handled. A juror will not be subject to the same priors, and is likely to put more weight on $p^J(e|H_V)/p^J(e)$. This means that a juror is more prone to the base rate fallacy. Furthermore, due to inexperience in assessing evidence, a juror is more likely to be impacted by imperfections in assessing evidence, such as cognitive biases and being persuaded by abusive rhetoric.

Thus, there are sources of failures in correctly assessing $p(H_V|e)$ in both the inquisitorial and adversarial procedures. While $p^J(H_V|e)$ is likely to be systematically high in an inquisitorial procedure, there is a risk of less accuracy in an adversarial jury trial. It has been pointed out in the literature that the competition between parties in an adversarial

process is likely to neutralize the impact from biased influences on each side.⁵⁷⁶ However, since the evidence are noisier, more evidence will then be required to reach an accurate decision. This requires that both parties have the proper incentives to provide sufficient evidence. This will be returned to below. Although the best compromise might seem to be an adversarial trial with professional decision makers, there will be a risk that too much weight is given to $p^J(H_V)$ in such trials. The reason is that professional decision makers rely too much on the priors to save personal processing costs rather than carefully scrutinizing the merits of the specific case.

Since the EU competition procedure is more of an inquisitorial character while the US procedure as a main rule is an adversarial process with jury trials, this means that $p^J(H_V|e)$ is likely to be systematically too high in the EU. In the US, $p^J(H_V|e)$ is more likely to not be associated with any systematic biases, but might still be wrong due to unsystematic imperfections in the assessment. More evidence will be needed to obtain accuracy by neutralizing the noise from assessment imperfections.

Costs

The cost of gathering evidence is also a component in the rational assessment of evidence. The decision value of gathering more evidence must be weighed against the cost. This tradeoff is returned to below. The efficiency in the amount of evidence will also be returned to below. Here the cost-efficiency of the production of a particular piece of evidence in the two systems will be discussed.

An inquisitor will gather evidence himself and thus take into account his own costs of gathering evidence. In this process, the inquisitor can ask the parties investigated to produce evidence combined with some presumption that, if it is not provided, it will be presumed unfavorable to the parties. The inquisitor can use this mechanism to save his own costs. However, if it is the inquisitor who can produce this evidence at the lowest cost, this use of presumptions will be inefficient.

In the adversarial system, the parties provide the evidence. Thus, an adversarial judge will ignore the costs of gathering evidence. Still, the judge may have some incentives to reduce his own costs of processing evidence by declaring evidence inadmissible. However, instead of incurring the efforts of declaring evidence inadmissible, it might be easier to just ignore the evidence. The costs of gathering evidence will be incurred by the parties at each

⁵⁷⁶ Froeb and Kobayashi (1996, 2001). See Parisi (2002) for a discussion.

side. Duplication in the production of evidence will prevent efficiency in evidence production in an adversarial trial. As mentioned above, each side might have an interest in performing some analysis to see if it yields a favorable result, but only the party with the favorable result will present it. The evidence will still be produced by both parties. Note that the duplication will be partially mitigated by deposition rules that give the parties partial access to evidence in the possession of the other party.

However, not all evidence is of such type that both parties will gather it. Whether it is the most efficient party that actually gathers the evidence will be dependent on how the parties believe it will be assessed. If the parties believe that the decision makers will use presumptions rationally in their assessments, they can lean back when they have produced the evidence that turns the presumption to their benefit and then wait for the attempt to rebut the presumption by the other party. As mentioned above, it is not likely that judges, and, in particular, jurors, will assess evidence rationally due to imperfections and biases. Thus, at least risk averse parties will rather produce too much than too little evidence. This means that evidence will be provided even if it would be more efficient for the opposite party to produce rebutting evidence based on a presumption. Thus, it is not likely that all the evidence will be produced by the lowest cost producer in an adversarial trial.

Thus, in both the inquisitorial and the adversarial systems there are imperfections that prevent evidence being gathered at the lowest possible costs. A benefit with the inquisitorial system is that it prevents the duplication in evidence production. When it comes to the use of presumptions throughout the process, the inquisitor is likely to impose too strong presumptions against the parties as the inquisitor saves his own costs by imposing burdens of evidence production on the parties. In the adversarial process, there are imperfections that prevent optimal presumptions. Still, the presumptions are not likely to systematically favor one of the parties. Based on this insight, we would likely observe stronger presumptions against the parties throughout the process in the EU, while in the US we will observe more duplication in the production of evidence. Furthermore, uncertainty regarding the use of presumptions by the decision makers in an adversarial process makes it likely that some evidence will be produced by parties even if the opposite parties could produce the evidence at lower cost.

Decision value and costs

Rational evidence gathering means that some evidence is gathered if the decision value exceeds the costs of gathering the evidence. The decision value is the expected reduced error

losses from gathering evidence. The decision value is a function of the changes in probabilities resulting from the evidence gathering and the error losses. The decision value is higher the more certain we are in finding evidence with strong probative force that makes it rational to change a decision to a decision associated with less expected error losses.⁵⁷⁷

The personal decision value of gathering evidence by an inquisitor depends on his personal probability assessment and personal error losses. The excessive preference from avoiding type-2 errors (not finding violation when there was a violation) will impact the decision value. The decision value of evidence that may make it rational for the inquisitor to change the decision from not violation to violation will be exaggerated. Conversely, the decision value of evidence that might change the decision from violation to not violation will be understated. This preference bias will be exaggerated by the confirmation bias as the probative force of evidence that supports violation will be exaggerated while the probative force of evidence that contradicts violation will be understated. The exaggeration of decision value for evidence with probative force in support for violation means that the inquisitor may find it viable to search for costly evidence in favor of violation even if the objective decision value does not justify the costs. Opposite, the inquisitor may not find it viable to search for costly evidence that contradicts violation even the objective decision value exceeds the cost.

It was shown above that an inquisitor will have an excessive incentive to impose presumptions that shift the cost of evidence production to the parties investigated. The parties may not find it viable to produce this evidence, even if it exists. As also explained above, because of the confirmation bias, the inquisitor is likely to exaggerate the probative force of this lack of evidence production, and thus give this lack of evidence higher decision value than is objectively justified. Thus, and on the contrary to Shin (1998), it was found that the inquisitor is likely to not only give high weight to omitted evidence, but also give too high weight to such omission.⁵⁷⁸

In the adversarial process, the decision value of evidence for judges will, in principle, correspond to the rational one, as there is no reason to believe that the judges systematically favor one error to another in contradiction with rationality. However, since it is the parties that gather the evidence, the question will be whether they have incentives to provide evidence according to the decision value of evidence. As described above, parties will provide

⁵⁷⁷ Recall that gathering evidence only has positive decision value if there is a chance that an outcome of the evidence gathering will make it rational to change the decision.

⁵⁷⁸ This is consistent with experimental evidence provided by Block and Parker (2004), who do not find support for the conclusion in Shin (1998).

evidence in a game where the incentive to provide evidence is dependent on the amount of evidence provided by the opposite party, the likely impact of the evidence on the decision, the private stakes, and the cost of producing evidence. Thus, there are several factors that determine whether it will payoff to gather evidence. The more evidence provided by the opposite party, the more likely it will pay off to gather evidence as it is more likely to have an impact on the decision. Furthermore, the more probative force a party think that the judge will give some evidence, the more they expect it will pay off to provide such evidence. This means that providing evidence that exploits imperfections and biases may pay off as much as evidence with real probative force.

Finally, the higher the private stake for the party, the higher is the expected gain from providing more evidence. The private stakes may deviate from the social stakes in the case. From this, it is easy to see that there are many reasons why the parties' payoff from providing evidence deviates from the rational decision value. The private payoff may be both larger and smaller than the decision value. However, if the stakes on both sides are higher than the social stake and not very asymmetric, the payoff to the parties of providing evidence is likely to be higher than the decision value.

Thus, the model predicts that, in both the inquisitorial and the adversarial systems, there will be other factors than the objective decision value and the objective social costs that determine whether some evidence will be gathered. In an inquisitorial procedure, there is a systematic effect of exaggerating the decision value of evidence supporting violation and understating the decision value of evidence that contradicts violation.⁵⁷⁹ In an adversarial process, there is not likely to be such a systematic effect. However, the private payoff of gathering evidence is likely to exceed the decision value in many situations, especially if the stakes are high and not very asymmetric. Note that if stakes are asymmetric we may observe excessive evidence in favor of the party with the higher stakes. The value of providing evidence will be higher for the party with the higher stake. This might bias the evidence gathered in favor of the party with the high stake.

⁵⁷⁹ This is consistent with Dewatripont and Tirole (1999), who predicts that an inquisitorial process yields more extreme results than an adversarial process, as the inquisitor is awarded more for a decision where they take a position rather than just making an intermediate decision that maintains the status quo. The result of this might be that an inquisitor is reluctant to gather more evidence, when he has evidence that supports taking a position, when there is a risk that more evidence will force him to take a decision that maintains the status quo. An experimental study by Block and Parker (2004) tend to support the conclusions in Dewatripont and Tirole (1999).

The amount of evidence

The next question is which system performs best in gathering evidence in the right amount. A general lesson from law and economics is that the inquisitorial judge has stronger incentives to economize the gathering of evidence, while more evidence will be gathered in the adversarial system.⁵⁸⁰

This is just a starting point, however.⁵⁸¹ The model framework shows that there might be reasons for an inquisitorial judge to excessively gather evidence. The excessive incentives to avoid type-2 errors are likely to create an excessive incentive to gather evidence that makes it rational to decide violation. Furthermore, the inquisitor is likely to take only his own costs into account. By transferring the cost of producing evidence to the parties investigated, the inquisitor is not likely to efficiently take the cost into account in the gathering of evidence. This might lead to an overproduction of evidence. Opposite, as the inquisitor has too weak incentives to gather evidence that contradicts violation, this might lead the inquisitor to gather a too little amount of evidence.

In the adversarial process, the evidence race, as such, is likely to yield excessive evidence gathering. Each party imposes an externality on the other party to produce more evidence when they gather evidence, which tends to give an equilibrium where too much evidence is gathered. This excessive amount of evidence can be exaggerated if the personal stakes for both parties are higher than the social stakes. In other words, rent-seeking is likely to create an excessive amount of evidence gathering.⁵⁸² However, if the personal stakes of one of the parties are lower than the social stakes, the amount of evidence gathered may be too little compared to the rational amount.

Thus, there are reasons why there might both be too little or too much evidence gathered in both the inquisitorial and adversarial procedure. Because of the evidence race, it is likely that the amount of evidence gathering is generally excessive in the adversarial procedure. In the inquisitorial procedure, there are not likely to be such systematic effects; however, there is likely to be a systematic effect that too much evidence in support of violation is gathered. Thus, while it is likely that an excessive amount of evidence is gathered in US antitrust procedure, it is likely that there will be too much evidence that support violation gathered in the EU procedure.

⁵⁸⁰ See Posner (1999), Dewatripont and Tirole (1999) and Parisi (2002). See also Spier (2007) and Posner (2011) p. 819 f.

⁵⁸¹ See Posner (1999) and Posner (2011) p. 819.

⁵⁸² See Parisi (2002) for a model that is informative for the amount of rent-seeking.

Sequential evidence gathering and decision making

Evidence should not only be gathered in the right amount, but also in the right sequence. An excessive preference for avoiding type-2 errors and the confirmation bias associated with the inquisitorial procedure is likely to distort evidence gathering to the search for evidence that has probative force in support of violation and avoiding gathering evidence with probative force contradictory to violation. Furthermore, as the inquisitor is likely to impose the burden of producing evidence excessively on the party investigated to save his own costs the evidence gathering will be distorted.⁵⁸³ In addition to the direct inefficiency of such excessive burdens, the inquisitor also lacks the incentive to impose those burdens at the right stage in the evidence gathering. The inquisitor may impose a burden on the parties to produce evidence too early, to avoid the effort of asking for more evidence at a later level.

In the adversarial procedure, the evidence gathering is in the hands of the parties. As mentioned above, the production of evidence in adversarial trials is dependent on the presumptions they believe that the decision makers will apply. If the parties are risk averse they are likely to produce too much evidence to be on the safe side. This will distort the optimal sequence of evidence gathering. Furthermore, due to the procedural rules, most evidence must be produced before the trial. In the terms of the game theoretical model above, this means that this model should probably be extended by making the evidence gathered by the opponent a stochastic variable the party must adapt to. The parties must “safeguard” against eventualities that will appear in the process and may even produce evidence that will not end up being used. This is not explicitly captured by the model presented above. The actual evidence gathering in adversarial processes is likely to be path-dependent. Small details in the procedure may have a large influence on the evidence gathering. This can probably best be modeled as an agent-based system.⁵⁸⁴ It will be beyond the scope for this study to present such a model here. Thus, further predictions cannot be provided, other than stating that the rationality in the sequence of evidence gathering is dependent on whether the parties believe that the decision makers assess evidence rationally, which, again, is dependent on degree the decision makers actually assess evidence rationally.

⁵⁸³ An illustrative anecdotal example of this is merger control, where the parties are required to produce substantial information, inter alia, on the definition of the relevant markets. It can be questioned whether it is rational that the merging parties provide all this information.

⁵⁸⁴ Agent-based modeling, also known as complex adaptive systems modeling or computational modeling, is based on algorithmic simulations of adaptive behavior. This modeling technique has become increasingly popular in economic modeling and can also be applied to the legal process. This is returned to in Chapter Six.

As described in the informal discussion in the subchapter on actual evidence assessment above, the EU procedure contains various instruments and stages that allow for sequential decision making. Even though this procedure provides a framework for rational sequential decision making, the evidence gathering is influenced by the imperfections that characterize an inquisitorial procedure, as explained above. The US adversarial system also contains some instruments for the courts to implement sequential decision making. The trial judge can use cost considerations to declare evidence inadmissible. By motions to dismiss, summary judgments, and judgments as a matter of law, the judge can decide upon evidence in the various stages of the process, as described above. These instruments can mitigate some excessive gathering characterized by the adversarial system. However, the question is whether the judges are properly informed and have the right incentives to apply these instruments rationally. As mentioned above, it requires efforts for the judge to declare evidence admissible for cost reasons, and it may be easier to just let it pass. Furthermore, the application of these instruments is, as a main rule, dependent on the parties requesting, them which reduce their applicability as an instrument for judges to implement rational sequential decision making.

Overall assessment

The discussion of what performs best of an inquisitorial or adversarial procedure has long traditions in the legal literature.⁵⁸⁵ The law and economics movement has provided substantial additional insight to this discussion the last decades. Contributions such as Posner (1973) and Posner (1988) advocate the adversarial system, while Tullock (1980) and Tullock (1988) endorse the inquisitorial system. The argument of Tullock is simplified based on the premise that the inquisitor is a truth-seeker who efficiently takes the costs into account in searching for the truth. The adversarial process, on the contrary, is a playing field for rent-seeking by agents arguing for the “truth” that suits them. Posner questioned both the incentives of the inquisitor and the performance of the inquisitorial process to illuminate the facts. This is consistent with the Chicago-school skepticism towards expanding the role of government in general. The adversarial process performs better according to Posner. Even if the parties in an adversarial trial speak for they own interest, the competition between the parties in providing evidence and finding flaws in each other argumentation, yield, as a starting point, an accurate assessment of evidence.

⁵⁸⁵ See Parisi (2002).

Several other seminal contributions have used economic models to illuminate the relative performance of the adversarial and inquisitorial systems.⁵⁸⁶ Many of these models are based on parties having asymmetric private information, and game theory is used to study which system performs best as a framework to bring forward information and in facilitating accurate decisions. Milgrom and Roberts (1986), Shin (1994, 1998), and Froeb and Kobayashi (1996, 2001) are examples of literature that, with various assumptions illuminate, how the adversarial procedure is superior to the inquisitorial procedure in revealing the facts.

Dewatripoint and Tirole (1999) model the incentives of the decision makers. The authors assume that a decision can favor either one of the parties or maintain the status quo. The last decision gives the lowest payoff to the decision maker. The authors find that an inquisitorial procedure tends to bias the decisions towards one of the extremes as the decision maker has no incentive to search for contradictory evidence when he has evidence that favors one of the parties. Thus, when the parties cannot manipulate evidence the adversarial process is superior as a fact-finding mechanism. If evidence can be manipulated, the superiority of the adversarial process depends on whether errors resulting from manipulation are better than the extremism generated by the inquisitorial process. There are also various experimental studies that test the predictions of the just mentioned literature.⁵⁸⁷ Neven (2006) survey much of this literature in an antitrust context. An interesting contribution is Parisi (2002), who models a sliding scale between the inquisitorial and adversarial process and finds an optimal degree of inquisition. Much of this literature was commented upon above. Parisi (2002) will be returned to below.

Accumulated research on actual evidence assessment is used as inputs in the model presented in this subchapter. It was shown how the imperfections and biases associated with the two systems of procedure are likely to affect the whole process of evidence assessment. The inquisitorial procedure is likely to be associated with a systematical bias in favor of finding violations. This not only affects the decision as such, but also what evidence is gathered, how much evidence is gathered, and in what sequence it is gathered. Thus, the imperfections and biases associated with the inquisitorial procedure are likely to be more extensive than it appears from a static perspective. When it comes to the adversarial procedure, the decision makers are not likely to be systematically biased in one or another direction. However, even if the decision makers are predictably biased, this is likely to be

⁵⁸⁶ Sanchirico (2012) surveys much of the economic literature on legal evidence.

⁵⁸⁷ See Block and Parker (2004).

mitigated by the adaption of the parties.⁵⁸⁸ A party with a bias against him will have incentives to produce more evidence to compensate. Furthermore, assuming that the marginal cost of producing evidence on the side of the truth is cheaper than producing evidence for some non-meritorious facts, this will create a competitive advantage for the one arguing for the truth. It was, however, found that there is a risk that evidence production will be too excessive in the adversarial process. However, because evidence is noisier due to the possible exploitation of biases and rhetoric, the decision maker needs more evidence for an accurate result. If the stakes are very asymmetric, the evidence production may also be too low in an adversarial process, and there will be relatively more evidence provided by the party with the high stakes. If it is assumed that the highest stakes are likely to be associated with monopolies who want to protect their rents, this might create a systematical bias towards non-violation decisions.

It cannot be deductively concluded from the discussion what system is best. This depends on whether the failures of the inquisitorial or adversarial procedures are worse. However, the analysis performed above tends to favor the adversarial system. Although the adversarial system is subject to weaknesses, it does not appear to be subject to the same systematic bias towards finding violations as the inquisitorial system is. Furthermore, the analysis has revealed that the evidence costs savings normally associated with the inquisitorial procedure are not as obvious as it appears when taking the biases into account. Too much evidence that favor violation is likely to be gathered in the inquisitorial procedure.

However, despite the lack of robust conclusions, conclusions can be drawn on which system is likely to have the best potential to be improved. As noted above, there is a sliding scale between the adversarial system and the inquisitorial system. The inquisitorial system can be improved with adversarial elements by extending contradictory rights, including formal hearings, internal peer review, and by strengthening the judicial review. This is descriptive for the evolution of the EU competition procedure, as described above. On the other hand, the adversarial system can be made more “inquisitorial” by giving the judge a more active role in the evidence administration and by giving the judge more opportunities to take initiatives *ex officio*. By this, we can approach an optimal mix of adversarial and inquisitorial elements.⁵⁸⁹

Based on the incentive structure, an improvement of the adversarial system seems to be the most promising to use as a basis for an improved system mixing adversarial and

⁵⁸⁸ See Froeb and Kobayashi (1996). See also Farmer and Pecorino (2000).

⁵⁸⁹ See Parisi (2002).

inquisitorial elements. Even if the inquisitorial procedure is improved, this will not fully solve the intrinsic problems associated with the incentive structure. An inquisitorial enforcement authority is there to find violations, and its performance in doing so will govern the incentives in evidence assessments. Judicial review will discipline the inquisitorial decision makers, but the investigated parties have a disadvantage since they have the burden to prove that the decision is wrong. In this operation, the investigated party will have to battle an excessive amount of evidence that favors violation gathered by the inquisitor, while the evidence that favors not violation is not sufficiently explored.⁵⁹⁰

In an adversarial system, it is not the incentives of the decision makers that are the main problem, but the failures associated with the evidence production of the parties and the risk of assessment failure due to the exploitation of imperfections and biases in the assessment of evidence. By extending the role of judges by increasing their role in demanding from the parties clear and explanatory statements on what inferences are supposed to be drawn from some evidence presented by the parties for evidence to be admissible, and by training the decision makers in handling possible assessment fallacies, the decision making can be improved. To facilitate this, requiring written assessments of the evidence assessment, including grounds on which inferences are drawn from the various elements of evidence will discipline the decision makers to analytically assess every piece of evidence and the inferences drawn from them. Furthermore, by enforcing the right to declare evidence inadmissible on the basis of cost considerations, the judge can mitigate both the problem of excessive evidence in general and excessive evidence from one party due to asymmetric stakes. More screening from judges will reduce the incentives for excessive production of evidence in the first place as it will be a less chance that the excessive evidence will be allowed into court. The problem is, however, that the judges do not have sufficient incentives to take the benefits of a more restrictive case administration fully into account. More administration requires more personal efforts by the judge. It seems likely that a stricter requirement of written evidence assessments may also help to mitigate this problem. After all, more evidence will extend the written decision that has to be produced, which also involves effort. This will give the judge an incentive for better evidence administration. Other procedural rules that increase the costs of providing excessive evidence and to balance the stakes in trial may also improve the adversarial system.⁵⁹¹ Rules such as treble damages in US

⁵⁹⁰ See Schinkel and Tuinstra (2006) for some similar arguments based on an analysis of antitrust enforcement in a model of collusion with private information.

⁵⁹¹ Other procedural rules are briefly discussed below.

Clayton Act, Section 4,⁵⁹² increase the stakes for the plaintiffs relative to defendants, which can balance some of the asymmetric stakes due to monopoly rent protection. However, such rules must be used carefully to balance asymmetries in stakes and not exaggerate them. The impact of other procedural rules is briefly discussed below.

Thus, the conclusion is that the adversarial procedure seems to be a better starting point for facilitating rational evidence assessment than an inquisitorial procedure. This is in line with the position of, and studies by, R. Posner and many of the game theoretical models presented above. This result also follows the general insight that a benevolent dictator theoretically performs best in obtaining optimality, though competition works best in practice, even if there are some extra costs involved.

5.4.6 Some comments on model complications

The impact of other procedural rules

Procedural rules not directly regulating evidence assessment are also likely to have a substantial impact on the performance of the actual evidence assessment. Also general procedural rules influence evidence assessments. The law and economics of procedure include several studies on strategic adaption to procedural rules and the effects on this strategic behavior on the performance of the decisions.⁵⁹³ It will be beyond the scope of this literature to study the variety of procedural rules. This study will just briefly address a few topics to illustrate the impact of procedural rules on evidence assessment.

Rules on settlements might affect the evidence competition. If some new evidence is presented by a party, the other party can choose either to try to refute the inference that can be made from evidence by other evidence, or try to settle. The conditions for settlements will affect the attractiveness for settlements. If the settlement rules make it difficult to settle on some “intermediate” solutions, this is likely to discourage settlements. As a result, the party may prefer to gather more evidence instead of attempting to settle. Thus, the settlement rules will influence the amount of evidence that will be gathered.⁵⁹⁴

Rules on the losing party’s duty to compensate the litigation costs incurred by the winning party may also affect the evidence collected.⁵⁹⁵ On the one hand, the requirement for the losing party to cover the cost of the winning party might boost the amount of evidence as stakes become higher. This rule might, however, also discourage the presentation of evidence

⁵⁹² 15 USC § 15.

⁵⁹³ Spier (2007) and Sanchrigo (2007) survey the literature. See also Posner (2011) Chapter 21.

⁵⁹⁴ See Posner (2011) p. 763 f. for an economic analysis of settlements.

⁵⁹⁵ See for, instance, Farmer and Pecorino (2000).

as presenting evidence encourages a response for the opposite party to gather more evidence which increases the potential costs that may have to be covered. The reason is that there is a risk that these costs must be covered in case of loss. Although the total effect is ambiguous, rules on compensating the winning party for his expenses are likely to affect the evidence gathering.

The rights to appeal also affect evidence decisions.⁵⁹⁶ If there is no right to appeal, stakes are higher in the first case, which increases the incentives to provide evidence. On the other hand, appeal rounds make the process bigger and longer, which probably increases the amount of evidence. Thus, even if the total effect is ambiguous, appeal rights are likely to affect the amount of evidence. Furthermore, the appeal possibilities are likely to affect the evidence assessment of the first instance decision makers because the first instance decision makers want to avoid their decision being declared void or overturned. This will discipline the evidence assessment in the first instance. This was partially discussed above in the context of how judicial review affects the evidence assessment of inquisitorial decision makers.

A related topic to the analysis of strategic adaption to procedural rules is the inferential value of the litigation decisions as such. In other words, does the litigation conduct have any probative force as evidence? What probative force can, for instance, be inferred from the observation that a suspect refuses to give a statement in court? Does this have probative force in support of violation? Might it ever be rational for a non-guilty person to refuse to give a statement? What is the signal value of a decision to appeal? Has the decision to appeal probative force in favor of the appellant? If so, could such a decision be used strategically by an appellant with a non-merit case? These topics have also been studied in law and economics.⁵⁹⁷

Multiparty decision making

So far, the decision of one single decision maker has been the focus of the above modeling of actual evidence assessment. In legal evidence assessment, it is often not one single judge that assesses evidence, but many judges or jurors who must make the decision in concert. In legal cases, the decision makers will typically be judges in collegiums or commissions, and often it is a laymen jury that decides upon the facts.

⁵⁹⁶ See Posner (2011) p. 806 f. and Posner (2008) for economic analyses of appeals.

⁵⁹⁷ See Sanchrigo (2007).

Collective decision making is analyzed in the theory of social choice.⁵⁹⁸ Kenneth Arrow was awarded the Nobel memorial prize in economics in 1971 based on, *inter alia*, Arrow (1951) which derived the impossibility theorem of social choice.⁵⁹⁹ Simplified, Arrow (1951) showed that it is impossible to construct a social utility function based on, *inter alia*, majority voting which generally satisfies the assumptions of rationality. A utility function based on majority voting might, for instance, conflict with the transitivity assumption. Incorporating game theory and the possibility of strategic voting makes the study of social choice quite complex, even in simple situations. The theory of social choice has been used to study legal decision making involving several judges.⁶⁰⁰ This study will not include a detailed study the impact of multiple decision makers on antitrust evidence assessment. However, a simple example will be used to show how collective decision making affects the outcome and performance of legal evidence assessment and may disturb the rationality of evidence assessment.

Assume that there are three alternative possible ways to assess evidence: assessment A, assessment B and assessment C. In an antitrust context, it can, for instance, be that some conduct can be seen as anticompetitive, anticompetitive but with counterweighing consumer gains, or pro-competitive (A, B, and C, respectively). For simplicity, assume that there are three judges that must decide on the evidence assessment together: Judge 1, Judge 2, and Judge 3. Judge 1 prefers assessment A, then B and then C. Judge 2 prefers assessment B, then C, and then A. Judge 3 prefers assessment C, then A, and then B. Thus, the three judges rank the evidence assessments in the following order:

Judge 1: $A > B > C$

Judge 2: $B > C > A$

Judge 3: $C > A > B$

Note that it is easy to see that the preferences are not transitive with majority voting. With majority voting, A would trump B, B would trump C, but C would trump A. Thus, an

⁵⁹⁸ See Binmore (2008) for a short introduction.

⁵⁹⁹ Further developed by another winner of the Nobel memorial prize in economics, Amartya Sen. See Sen (1970, 1995, 1999).

⁶⁰⁰ See, for instance, Easterbrook (1982, 1984b) and Kornhauser (1992a, 1992b). See Rubin (2000) for a review of the literature.

aggregate utility function based on majority voting would not satisfy the transitivity axiom of rationality.

Assume that assessment A means that the law is violated, while B or C means that the law is not violated. The rules for voting determine if it is decided violation or not. Assume that the decision makers only have the option to choose between A and B. There are no incentives for strategic voting, only to vote the preferred alternative. Both Judges 1 and 3 prefer A to B, while Judge 2 prefers B to A. The result with majority voting would be assessment A. Thus, violation would be decided in a majority vote between A and B. In a requirement of unanimity on A for A to win, assessment B would win. Now assume that the decision makers only can choose between A and C. Both Judges 2 and 3 prefer C to A, and C would win majority voting. Thus, not violation would be decided in the majority between A and C. C would also obviously win with a requirement of unanimity on A for A to win. Thus, we can see that the alternative rules of voting determine whether violation or not violation is decided.

Assume now that the two alternatives to vote for are violation and not violation. Now there is room for strategic voting. It is not a majority for finding violation (A), but finding violation is better than B for Judges 1 and 3. Assume now that it is first voted for violation or not violation. If not violation is found, it is voted for B or C as the ground for not violation. An example could be that the court first decides violation or not violation, and then, after that, vote for who will write the opinion. Judge 3 prefers violation to B. This means that if Judge 3 believes that the result of a vote between B and C will be B, it is better to vote for violation in the first place. We will not go into the further game theoretic analysis here, but the optimal vote depends on the voters' belief of the preference order of the other voters. The same applies if we assume that the votes are done in opposite order. If it is first voted between C or B as the grounds for deciding not violation, and then violation is voted against on this ground, the optimal vote of each judge will depend on their beliefs of the preferences of the other judges.

We see that the order and alternatives of voting are crucial when there are multiple decision makers. By trying to influence the alternative hypotheses that are subject to voting the result can be manipulated. Trying to manipulate the decision maker's alternative hypothesis in the assessment of evidence is, of course, also important with only one decision maker as this might mislead the decision maker to choose the most probable hypotheses among the alternatives as the most probable hypothesis overall, even if there exists another

even more probable competing hypothesis. However, a rational decision maker cannot be manipulated in this way. With collective decision making, the choice of alternatives can affect the outcome even if all of the decision makers are individually rational. It is the social choice that becomes irrational.

The irrationality of social choice has relevance for both inquisitorial and adversarial decision making as long as it is multiple decision makers who have to make the decision. There are no grounds to say that the nature of collective decision making works systematically differently in the two systems. However, in an adversarial system, the parties in the process have a better opportunity to exploit the multi-party nature of the decision making in the procedure. From this, it is natural to assume that irrationalities due to multiple decision makers more easily can be exploited in the US than in the EU. Jury trials are likely to increase this opportunity as juries come together ad hoc and do not interact with each other repeatedly.

Another difference between the EU and US that is related to collective decision making is the possibility of dissenting opinions in the US. The possibility of dissent may mitigate the rationality failures of collective decision making as each judge may deliver their own opinion, or at least decide if they are with the minority or majority. This means that fewer compromises have to be made.⁶⁰¹ This has only a limited relevance for evidence assessment, because the evidence assessment in the US, as a main rule, is made by a jury who does not deliver grounded evidence assessments or dissenting opinions. Still, in those situations where judges conduct actual evidence assessment as described above, the possibility of dissent may mitigate some of the irrationality that may follow from collective decision making.

5.5 Conclusions

The chief research questions addressed in the beginning of this chapter were: *How should antitrust evidence be rationally assessed? Do the assessment principles and procedures in antitrust analysis promote rational evidence assessments? How can the assessment principles and procedures used in antitrust analysis be improved to promote rational evidence assessments?* These questions are addressed in turn below.

⁶⁰¹ For a law and economics based analysis of dissents, see Epstein et al. (2011).

How should evidence be rationally assessed?

On the question of how evidence should rationally be assessed, this chapter started by citing Beckner and Salop (1999), who stated that “[t]he court first should gather information that is least expensive, resolves the most uncertainty, and is most likely to affect its decision”. Using a model of rational evidence assessment, more content was added to this statement. Rational evidence assessment is about minimizing the sum of the expected loss of errors from making a wrong decision and the cost associated with gathering evidence.

A piece of evidence should be gathered if its decision value exceeds the cost of gathering the evidence. The decision value of evidence is the evidence’s ability to reduce the expected loss from errors. It will only have a decision value to gather some evidence if there is a chance that the outcome of the evidence gathering makes it rational to change the decision. In other words, gathering evidence only has decision value if there is any chance that gathering the evidence will influence the decision. The decision value of evidence depends on the probative force of evidence and the losses from errors. The probative force of evidence is the extent the evidence influences the probability of a hypothesis. In rational evidence assessment, the laws of probability determine the probative force. The decision value is higher, the higher the chance that gathering evidence will have as an outcome that we with strong probative force are right in changing our decision to a decision associated with a less expected error.

The costs of gathering evidence should be as low as possible. This means that evidence should be gathered by the one who can gather it at the lowest costs. This can be implemented by the use of presumptions that disfavor the low cost producer. This will give the party who has the lowest cost in producing the evidence the incentive to provide the evidence.

Evidence should be gathered in the right amount and in the right sequence. The tradeoff between decision value and cost facilitates the gathering of a right amount of evidence. By gathering evidence in the right sequence, a rational decision can be taken at each stage. One can then rationally decide whether it is efficient to gather more evidence or to decide upon the evidence already available. The rational sequence of evidence gathering depends on both decision value and costs. The cheapest evidence with the highest decision value should be gathered first. However, dynamical programming is necessary to determine the right sequence of gathering evidence.

Do the assessment principles and procedures in antitrust analysis promote rational evidence assessment?

Antitrust decision makers are not likely to formally use probability theory and expected loss minimization in their overall assessment of evidence. The formal use of probability theory might, however, appear in elements of the evidence assessment, such as when statistical and econometric evidence is evaluated. Rather, the overall assessment of antitrust evidence can better be described as abductive reasoning, where the one that assesses evidence searches for plausible explanations of the evidence to ultimately find a best explanation. Abductive reasoning includes the use of informal methods such as presumptions, analogical reasoning, and appeal to expert knowledge. All these elements are crucial to actual evidence assessment in both the US and EU. Presumptions are an important instrument in antitrust evidence assessment. Antitrust decision makers regularly use analogy by referring to evidence assessments in previous decisions. Expert knowledge, in particular economic expert knowledge, has a crucial role in informing antitrust decisions.

It has been argued in the literature that abductive reasoning, as a starting point, gives the correct evidence assessment. The question is whether there are imperfections and biases that distort the evidence assessment out of being correct. There are several sources of imperfections and biases that are likely to distort antitrust evidence assessment. The decision makers are maximizers of utility subject to institutional incentives, the decision makers can be influenced by cognitive biases, there is a risk of errors associated with the use of analogies, experts might be biased, and rhetoric can be abused by the parties in the argumentation. The impact of these imperfections and biases is likely to be dependent on whether the procedural system is inquisitorial or adversarial.

When it comes to inquisitorial systems, empirical research and literature have suggested that an inquisitorial decision maker is subject to a prosecutorial bias that systematically favors the evidence assessment in favor of violation. Some of this literature directly addresses antitrust and, in particular, the enforcement of the European Commission. The prosecutorial bias is a result of both incentive biases and cognitive biases. Since an inquisitorial enforcement authority is awarded for what it does, it is likely to be subject to an incentive bias in favor of finding violations. The inquisitor is also likely to be subject to a confirmation bias, which is a cognitive bias. According to the confirmation bias, people tend to assess evidence in a way that confirms already established beliefs which means to confirm a belief of violation in the context of a prosecutorial bias.

By using economic modeling, it was found that the prosecutorial bias has additional consequences for the rationality of evidence assessment beyond the pure static effect in terms of a wrong evidence assessment. The inquisitor has an incentive to excessively search for evidence that has probative force supporting violation and to search too little for evidence that have probative force in contradiction of violation. In addition to the prosecutorial bias, the inquisitor has an incentive to save his own cost by transferring the burden of producing evidence to the investigated parties by the use of presumptions. This will lead to inefficiency in the gathering of evidence. Combined with the confirmation bias, the inquisitor is likely to give too strong probative force to the failure of the parties to produce evidence. Thus, the incentives to reduce costs reinforce the effects of the prosecutorial bias. Since the EU competition procedure is best characterized as inquisitorial, the conclusion is that the evidence assessment in the EU competition law enforcement is likely to be systematically biased, favoring violation. Furthermore, evidence is not likely to be gathered rationally. There will be an excessive search for evidence that has probative force supporting violation. Furthermore, the cost of gathering evidence is not likely to be efficient because the European Commission has an excessive incentive to impose a burden on the parties investigated to produce evidence.

When it comes to the adversarial procedure, the decision makers are not likely to be subject to systematical biases towards either finding violation or finding not violation. This does not mean that the decision maker cannot be biased, just that there is no reason to believe that the decision makers have some systematic preferences for violation or not violation. However, the adversarial procedure is characterized by the parties (represented by lawyers) arguing for their own interest. The parties are likely to try to exploit cognitive biases and argue on the basis on analogies without merits if it benefits their case. Furthermore, since the main rule is that the parties choose their own experts to support their arguments, there is likely to be a biased selection of experts with professional preferences supporting the party appointing them. Furthermore, even if experts are repeat players and have a reputation to maintain, it cannot be ignored that the experts will do efforts in satisfying their paying clients, which will bias the expert opinions away from the purely professional. The parties are also likely to abuse rhetoric in influencing the decision makers. These imperfections are likely to be exaggerated in laymen jury trials, as juries are not experienced in filtering out and adjusting for imperfections and biases. Thus, there is likely to be more noisy evidence in an adversarial trial. The more noisy evidence, the more evidence is needed for an accurate

decision. The model developed in this chapter along with insight from other modeling efforts were used to gain further information on performance of the adversarial trial. A beneficial effect of the evidence competition in an adversarial trial is that if a party believes that the decision maker is subject to some systematic bias, he has an incentive to mitigate this by evidence production. Furthermore, if we assume that providing evidence on the side of the truth is cheaper than fabricating evidence, the party with the truth on his side has a competitive advantage. Thus, this is an argument that biases, if they are present, are not as harmful in the adversarial procedure as in the inquisitorial procedure.

However, the adversarial process facilitates an evidence race that tends to lead to excessive evidence production. This is exaggerated by high stakes in the case. Thus, there is a potential for rent-seeking. However, if the private stakes are low compared to the social stakes too little evidence may also be produced. If stakes are asymmetric, it is likely to be an imbalanced amount of evidence in favor of the party with the high stakes. Thus, if we make an assumption that we are likely to observe asymmetric stakes in cases where a defendant wants to protect its monopoly profits, then there might be a systematic bias towards findings of not violation in these cases.

Thus, there are likely to be deviations from rationality both in the inquisitorial EU system and adversarial US system. Which system that performs best depends on whether the failures of the inquisitorial or adversarial procedure are worst. However, the analysis performed in this chapter tends to favor the adversarial system. Although this system is subject to weaknesses, it does not appear to be subject to the same systematic bias toward finding violations as the inquisitorial system. Furthermore, the analysis has revealed that the evidence costs savings normally associated with the inquisitorial procedure are not as obvious as it appears, taking the biases into account. Too much evidence in favor of violation is likely to be produced in the inquisitorial system. Although the evidence is noisier in the adversarial system, the absence of a systematically biased evidence assessment in one direction and the excessive amount of evidence is likely to facilitate a more accurate decision as long as the stakes are not too asymmetric.

Since there is no clear answer as to which system performs best, the answer is dependent on which systems are most promising for being improved. This will follow next.

How can the assessment principles and procedures used in antitrust analysis be improved to promote rational evidence assessments?

There is a sliding scale between the adversarial system and the inquisitorial system. The inquisitorial systems can be improved with adversarial elements by extending contradictory rights, including formal hearings, internal peer review, and by strengthening the judicial review. This is descriptive for the evolution of the EU competition procedure as described above. On the other hand, the adversarial system can be made more “inquisitorial” by giving the judge a more active role in the evidence administration and by giving the judge more opportunities to take initiatives *ex officio*. By this, we can obtain an optimal mix of adversarial and inquisitorial elements.

Based on the incentive structure, an improvement of the adversarial system seems to be the most promising starting point for better antitrust procedures. Even if the inquisitorial procedure is improved by instruments such as increased contradictory rights and peer review mechanisms, this will not fully solve the intrinsic problems associated with the incentive structure. An inquisitorial enforcement authority is there to find violations, and its performance in doing so will govern the incentives in evidence assessment. Judicial review will discipline the inquisitorial decision makers, but the investigated parties will be in an inequality of arms when it has the burden to prove that the decision is wrong. In this operation, the investigated party will have to combat an excessive amount of evidence favoring violation while evidence contradictory to violation is not properly explored.

In an adversarial system, it is not the incentives of the decision makers that are the main problem, but the failures associated with the evidence production of the parties and the risk of assessment failures due to the exploitation of imperfection and biases in the assessment of evidence. By extending the role of judges in demanding from parties clear statements as to what inferences are supposed to be drawn from some evidence presented for evidence to be admissible, and by training the decision makers in handling possible assessment fallacies, the decision making can be improved. To facilitate this, requiring written evidence assessments, including grounds on what inferences that are drawn from the various elements of evidence, will discipline the decision makers to analytically assess every piece of evidence and the inferences made from them. Furthermore, by being able to declare evidence inadmissible on the basis of cost considerations, the judge can mitigate both the problem of excessive evidence in general and excessive evidence from one party due asymmetric stakes.

More screening from judges will, in itself, reduce the incentives for excessive production of evidence in the first place as there will be less chance that excessive evidence will be allowed into court. The problem is, however, that the judges do not have sufficient incentives to take the costs fully into account. More evidence administration requires more personal efforts by the judge. A stricter requirement of written evidence assessments may help also to mitigate this problem. After all, more evidence will extend the decision that has to be written, which also involves effort. This will give the judge a stronger incentive in the evidence administration to weigh the benefits of additional evidence against the costs. Other procedural rules, such as rules that increase the costs of providing excessive evidence and tend to balance the stakes in a trial, may mitigate some of the problems associated with an adversarial procedure. Rules such as treble damages increase the stakes for the plaintiffs relative to defendants, which can balance some of the asymmetric stakes due to monopoly rent protection. However, such rules must be used carefully to balance the asymmetries of the stakes and not to exaggerate the asymmetries.

Thus, the conclusion is that there is room for improvements that facilitate more rational evidence assessments. An adversarial procedure supplemented by some “inquisitorial” elements seems to be the best starting point for better evidence assessments, rather than an inquisitorial procedure supplemented with “adversarial” elements.

As a final remark, note that the appeal to expert knowledge, in particular the economic expert knowledge, is an essential feature of antitrust evidence assessment. Thus, rationality in the assessment of economic models in antitrust analysis is imperative in obtaining rational evidence assessments in antitrust analysis. This will be the topic of the next chapter.

6 Rationality in the assessment of economic models in antitrust analysis

6.1 Introduction and motivation

The use of economic models is a central feature of antitrust analysis. Inferences based on economic models are both used directly by the antitrust decision makers and with the aid of economic experts involved in the specific cases. Thus, rationality in the assessment of economic models is a crucial element in obtaining rational antitrust analyses.

This chapter will first describe economic models and how economic models are utilized in antitrust analysis. Then, the decision theoretic framework established in Chapter Three is further developed to include directions for how to make rational inferences based on economic models. After this, it is discussed whether the assessment principles and procedures used in antitrust analysis are likely to facilitate a rational assessment of economic models. This includes questions such as whether the most informative economic models will be brought to the table and whether the models will be assessed according to their informative value. Critique and suggestions for improvements will be presented throughout the discussion.

The chief research questions of this chapter are: *How should economic models be rationally assessed in antitrust analysis? Do the antitrust assessment principles and procedures applied in antitrust analysis facilitate a rational assessment of economic models? How can the rationality in the assessment of economic models in antitrust analysis be improved?*

6.2 Economic models in antitrust analysis

6.2.1 What is a model?

Instrumentalism versus realism

A model used for inference can be described as some assumptions on the structural links between phenomena or events, including causal links. The terms “models” and “theories” are often used interchangeably in science. The term model is mostly used in this chapter, although the term theory might also appear. Before going into details on what a model is, the difference

between realism and instrumentalism in modeling should be clarified.⁶⁰² In realism, the goal of modeling is to establish true links between phenomena. For instance, a realism-based model can be used to explain the true cause of some consequence. In instrumentalism the goal of modeling is to make models that can predict. The separation between realism and instrumentalism is important. Different models can be good or bad, depending on whether they have a realistic or instrumentalist purpose. A model that gives a good description of what we think is reality, but performs poorly for predictions might still be preferred by a realist. Conversely, a person with an instrumentalist purpose might prefer a model that is known to not describe reality, as long as it gives good predictions. Assume, for example, that we flip a fair coin that can land on heads or tails. A model of the outcome of the flip is that it lands on heads with probability 0.5. For a realist, this might be a bad model. Unless we incorporate quantum level uncertainty, there is no genuine uncertainty associated with the outcome of the flip; thus, genuine uncertainty is not a good explanation for the outcome of the flip. By knowing the starting position of the coin, and all the forces that act upon the coin, we can provide a realistic model of the outcome of the flip. We can then with the help of natural laws explain why the coin landed on heads. However, for an instrumentalist knowing that the coin is fair, a model assuming that the probability of heads is 0.5 would make correct predictions in 50 percent of the flips on average and provide good predictions on the number of heads we are likely to observe after large number of flips. A more complex but realistic model may not perform better within operational frames, at least not without probative costs. Even genuine uncertainty does not affect the outcome of the flip, assuming so works for predictions.

In economics, the distinction between instrumentalism and realism, and perhaps the failure to acknowledge this distinction, has triggered extensive debates. In the current neoclassical paradigm, the agents are often modeled as rational in the economic models. This has been subject to criticism. This critique might be justified against those who, on the basis of realism, defend the current neoclassical paradigm. Research by Nobel laureates in economics⁶⁰³ has shown that a person's actual behavior might deviate substantially from what is considered rational behavior. However, if the defense of the current neoclassical paradigm in economics instrumentalism-based, the question of whether models are good or bad is a question of the models' ability to predict economic outcomes.⁶⁰⁴

⁶⁰² See for instance Sober (2008) p. 96 f. See also Lianos (2010).

⁶⁰³ This will be described in more detail in the subchapter on economic models below.

⁶⁰⁴ The instrumentalist approach to economic modeling is stressed by the Nobel laureate economist Milton Friedman; see, for instance, Friedman (1953). McKenzie (2010) is a recent contribution that defends the current neoclassical paradigm of economics in the basis of instrumentalism.

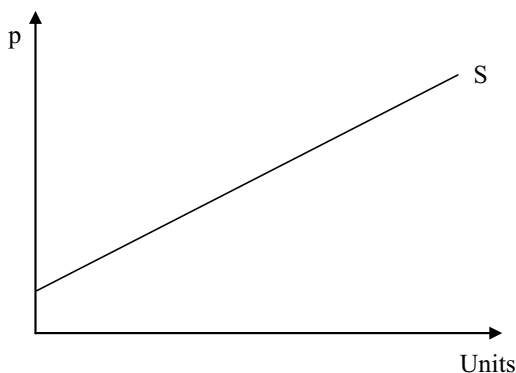
Instrumental and realistic models are not mutually exclusive. Models can contain elements of what we believe the truth is and still be used for prediction purposes. Most models are often simplified and idealistic representations of the true links between phenomena. Models screen out some single links that are necessary for analysis that is performed. For instance, assuming that the earth is a perfect sphere might work for some analysis purposes, but not for others.

Models can be seen as information. Knowledge of a model reduces the uncertainty by not knowing the full reality.⁶⁰⁵ Thus, a model has information value. This study is concerned with using models in antitrust analysis. This means that a model's value is dependent on its ability to make antitrust decisions better. This will be discussed further below.

The representation of a model

Some vague ideas of what a model is are now presented. A model is some simplified representation of links between phenomena or events that can be used to explain and predict. There are many ways to represent and express a model. For instance, a map is a model of a geographical area, and a metro guide is a model of the metro system. In the context of antitrust analysis, we are concerned with the economic links between phenomena. A model of the economic links between phenomena can be expressed verbally. The sentence: "if price increases the supply increases" express a model of the link between prices and supply verbally. The verbal model can also be expressed in more logical terms of the type: if price increases then supply increases. Models can also be expressed by graphs or figures. The relationship between supply and price level is illustrated in figure 6.1:

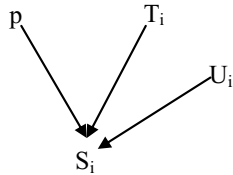
Figure 6.1: graphical model of relationship between price and supply



⁶⁰⁵ See Anderson (2008) p. 52 f. for an information theoretic approach to models.

In Figure 6.1, the supply, S , measured in units increases as the price, p , increases. Models can also be expressed by mathematical graph theory as illustrated in Figure 6.2.

Figure 6.2: graph model of relationship between price, technology and supply of a firm



The graph in Figure 6.2 illustrates that the supply of company i , S_i , is dependent on the market price, p , the technology of company i , T_i , and other factors, U_i , not captured by the model.

Verbal, logical, and graphical representations of a model might provide intuition and may be illustrative of the links between phenomena and events. However, for more exact measurements of the links between phenomena and events, we need mathematical models. The phenomena and events that are linked with the model then become variables in an equation. For instance, we can write a model of supply in a market as

$$Y = S(p, c).$$

The supply, Y , is linked to the price, p , and the marginal cost, c . By assuming that $S'(p) > 0$ and $S'(c) < 0$, the supply is increasing in price and decreasing in marginal cost. The model illustrates the link between supply, price, and cost. How can we take into account all other factors that affect supply? In statistical modeling, other factors can be described by a stochastic residual term, ε . That means that all other factors except the explicit modeled variables are captured by ε . This means that the model of supply can be written as

$$Y = S(p, c, \varepsilon).$$

A special case of this model is that the variables are linearly related, which means that we can write

$$Y = \beta_0 + \beta_1 p + \beta_2 c + \epsilon.$$

Statistical analysis can be used to estimate the parameters β_0 , β_1 , and β_2 . This will be discussed further below. If Y is the variable we seek to explain or predict based on p and c , Y is the response variable while p and c are explanatory variables.

So far, the causality issues have been avoided; the relationship between variables has been described by the more vague term “link”. The link might capture both a causal relationship and third variables that link variables together somehow. In practice, we are often concerned with causality, and we want to use models to assess casual relationships. Does a medical treatment really work? What will happen to supply if the costs increase? Does a conduct under antitrust scrutiny cause anticompetitive effects? Causality and modeling is a complicated issue that will be explored in more detail below.

Models calibrated with data

Assume as above that we operate with a model of the type $Y = \beta_0 + \beta_1 p + \beta_2 c + \epsilon$. If we have some real world data on the combinations of y , p , and c , we can use statistical methods to calibrate the parameters β_0 , β_1 , and β_2 with real world data. This is a simple example illustrating the principles of statistical regression. Econometrics is the use of statistical methods in the context of economic models.

The calibration of the model to data consists of finding estimators for the parameters β_0 , β_1 and β_2 that best fits the model and apply the given data to these estimators to get estimates. An intuitively appealing method of finding estimators is the method of least squares. This is one of many methods to derive estimators to find estimates that fit as good as possible with the observations (data).

Assume that we have the n observations $(y_1, p_1, c_1) \dots (y_n, p_n, \dots c_n)$ which combines various observations of the response variables with observed combinations of the explanatory variables. The least squares method consist of finding estimators β_0^\wedge , β_1^\wedge and β_2^\wedge for the parameters β_0 , β_1 and β_2 , respectively, that minimize the sum of the squares of the differences between observed and estimated values. This means that β_0^\wedge , β_1^\wedge , and β_2^\wedge is determined by solving

$$\min \sum_i (y_i - (\beta_0^\wedge + \beta_1^\wedge p_i + \beta_2^\wedge c_i))^2 \text{ with respect to } \beta_0^\wedge, \beta_1^\wedge, \text{ and } \beta_2^\wedge.$$

By derivation of $\sum_i (y_i - \beta_0 - \beta_1 p_i + \beta_2 c_i)^2$ with respect to β_0 , β_1 and β_2 , we get estimators of β_0 , β_1 and β_2 as functions of $(y_1, p_1, c_1) \dots (y_n, p_n, c_n)$.

Note that β_0 , β_1 , and β_2 are just estimators providing an estimate for the true parameters, β_0 , β_1 , and β_2 . Even the model is “correct” in meaning that this is the true model that generated the data, the estimates are not necessarily equal to the true values β_0 , β_1 , and β_2 . If Y was not influenced by the residual ε , we would be able to infer the true parameters as long as we had more observations than parameters to estimate. The residual ε creates a random variation in data.

As long as the residuals (the ε 's) for each observation are independent of the other explanatory variables, independent of each other, have zero expectation, and have a constant variance σ^2 , the random variation created by the ε 's cancels each other out in the long run in deriving least squares estimates. The expectation of the least squares estimates of the parameters is the true values of the parameters (unbiased estimators) as long as the assumptions hold. Furthermore, the estimators are consistent. With a large enough amount of data, the probability that the estimate is different than the real value can be arbitrarily small as long as the model assumptions are correct.

The method of least squares is a simple, intuitive method of deriving estimators. However, there are many other more advanced principles for determining estimators and estimates. Different methods of estimation have different properties. Some may perform in terms of being unbiased, while other performs better in terms of lower variance. It will be beyond the scope of this study to give a survey of these methods.

Nevertheless, maximum likelihood estimation will be briefly described with the same model $Y = \beta_0 + \beta_1 p + \beta_2 c + \varepsilon$ as an important method of deriving estimators. If we assume the ε 's are identically and independently distributed, and that the ε 's are independent of the explanatory variables (exogenous), the probability density for Y_1, \dots, Y_n can be written as follows

$$f_{Y_1, \dots, Y_n}(y_1, \dots, y_n | p_1, \dots, p_n, c_1, \dots, c_n; \beta_0, \beta_1, \beta_2) = \prod_i f_Y(y_i | p_i, c_i; \beta_0, \beta_1, \beta_2).$$

We can multiply the probabilities since the ε 's are independent and the c and p 's are exogenous, which makes Y_1, \dots, Y_n independent of each other. Thus, the simultaneous distribution of Y_1, \dots, Y_n is according to the product rule of independent probabilities, the product of the probability of the individual Y_i 's. The likelihood function $L(\beta_0, \beta_1, \beta_2)$ is

$$L(\beta_0, \beta_1, \beta_2) = f_{Y_1, \dots, Y_n}(y_1, \dots, y_n | p_1, \dots, p_n, c_1, \dots, c_n; \beta_0, \beta_1, \beta_2) = \prod_i f_Y(y_i | p_i, c_i; \beta_0, \beta_1, \beta_2).$$

The maximum likelihood estimators for β_0, β_1 , and β_2 are

$$\hat{\beta}_0, \hat{\beta}_1, \hat{\beta}_2 = \arg \max_{\beta_0, \beta_1, \beta_2} L(\beta_0, \beta_1, \beta_2).$$

The maximum likelihood estimators can be considered as those estimators that maximize the likelihood of the observations. If we consider observations as evidence, we can say that the maximum likelihood estimators are those estimators that make the model most consistent with the evidence. It can be shown that if the ε 's are independent and normally distributed with expectation 0 and variance σ^2 , then the maximum likelihood estimators and the least squares estimators coincide.⁶⁰⁶

Calibrating models to data is, in practice, to force the parameters of a model to fit as much as possible with the data, regardless of the true mechanisms that generated the data. If the model is far from the true mechanisms that generated the data, the model is not likely to be very good as an instrument to explain and predict the observed data. With statistical inference, we can make inferences on the parameters and the models as such. By exploiting the assumed probabilistic nature of observations, we can test, for instance, whether the observations are likely given certain assumptions of the parameters, for instance, that a parameter is zero. We can also calculate the information value of a model as such by testing how well a model explains and predicts data. These issues are returned to in the discussion of rational model-based inferences below.

Models and causal inferences

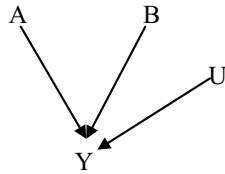
A general description of models was given above. In this section it is discussed how to utilize models to assess causal connections. Economic models will inspire the examples, but the full discussion on the logic and structure of economic models will be returned to in the next subchapter.

Model-based causal inferences can be illustrated by a simple example. The effect Y is dependent on two explicit variables A and B . The residual, U , captures circumstances, other

⁶⁰⁶ See Wasserman (2003) p. 212 f.

than A and B, that influence Y. The model can be written as $Y=f(A,B,U)$. In a graph, this model might look as in Figure 6.3.

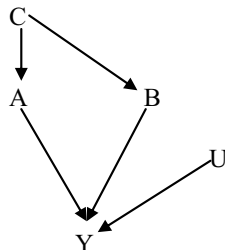
Figure 6.3: graph for simple casual analysis.



In the graph in Figure 6.3, it is assumed that A and B, together with U, determines Y. Both A and B are exogenous. This means that it is no third variable that influences Y both through A and by another path. The same applies to B. To figure out if a cause is necessary, we can manipulate on the variable representing what we want to check if is a necessary cause. Assume that we want to investigate whether some agreement has an anticompetitive effect. We can let A be the agreement, so $A=\text{true}$ means that the agreement is present and $A=\text{false}$ means that the agreement is not present. To investigate the anticompetitive effect, we can compare $Y_1=f(A=\text{true},B=b,U=u)$ with $Y_2=f(A=\text{false},B=b,U=u)$, where Y is some measure on the degree of competition. If Y in the first case is lower than in the last case, we can conclude that the agreement has an anticompetitive effect within the model.

A complication would be to introduce a confounding variable, C. This would make the graph look like in Figure 6.4.

Figure 6.4: causal analysis with confounding variable



In the graph in Figure 6.4, A and B are no longer exogenous. The exogenous variable is C. C affects Y both via A and B. This makes the counterfactual analysis more complicated. If we want to investigate how Y will be affected by another value of A by directly manipulating of

A in the model, we will not get the same answer as if the same A were determined endogenously. This means that if we counterfactually insert $A=a$ in the model by holding the other variables fixed, we will not get the same value of Y as if A was determined by C. The reason is that by directly setting $A=a$, A is decoupled from C. C affects A and B, and determines the A's and B's that are "consistent" with each other. In other words, A and B are correlated. As an antitrust example, we can assume that C is an agreement on price between competitors. This has the following effects on the consumer surplus Y: a negative effect by increased prices (A) and a positive effect from increased competition in various non-price dimensions (B) such as quality. Assume that we want to assess the effect of the agreements by putting the counterfactual competitive price into the model, holding all other variables constant. This means to use a model $f(A,U)$ and compare $f(A=\text{conspiracy prices}, U=u)$ with $f(A=\text{competitive prices}, U=u)$, holding everything else equal. This is likely to overstate the negative effects of the agreement, as the benefit from non-price competition is not taken into account. A real counterfactual analysis of the presence of the agreement must include its effect on Y, both via A and via B. The manipulated variable has to be exogenous for a correct counterfactual analysis. The exogenous variable is C. For counterfactual analysis we should compare $f(C=\text{agreement}, U=u)$ with $f(C=\text{no agreement}, U=u)$.

Exogeneity might also be disturbed by a confounding variable C that affects both the explicit modeled variables and U. This is illustrated in Figure 6.5.

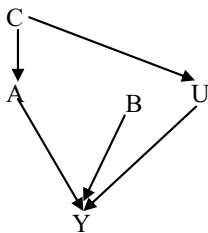
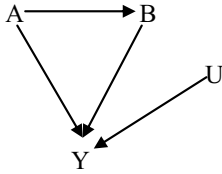


Figure 6.5: endogeneity between explicit modeled variable and the residual

In the model illustrated with the graph in Figure 6.5 it is a third variable C that affects both A and U. This endogeneity raises the same problems discussed above. In statistical analysis, it is very important to correct for this kind of endogeneity to obtain unbiased estimates.

In a model of causality, we might both have direct and indirect effects. This is illustrated in Figure 6.6.

Figure 6.6: indirect effects



In the model illustrated by the graph in Figure 6.6, A affects Y in two ways: directly and indirectly, via B. In some circumstances, one may only be interested the direct effect and in other circumstances only the indirect effect, while yet in other circumstances, in the total effect. The various effects can be isolated in a model, if one, for instance, only wants to assess the direct effects. The model in the graph in Figure 6.6 can be written mathematically as $Y=f(A,B(A),U)$. In this model B, is a function of A, so we might have written $Y=f(A,U)$. By using $f(A,B(A),U)$, B can be held fixed and we can assess the direct effect of A. Normally, it is the total effect we are interested in for the counterfactual assessment. A model only capturing the direct effects will give wrong inferences in a counterfactual analysis where the total effect should be taken into account. Assume, for instance, that we want to assess the effects of a merger. The arrow between A and Y is the direct effect of the merger on the market, everything else equal. This means that if a merger is prohibited status quo will prevail, while if the merger is consummated the rest of the market is assumed to remain identical. This ignores substantial indirect effects. If the merger is prohibited, this might lay the grounds for other mergers. If the merger is cleared, this might create a merger wave. Taking into account these effects is essential for a correct assessment of the effects of prohibiting the merger.

So far, the model-properties of U are neglected. Assume that U is modeled as stochastic. This makes the inferences from the model probabilistic. More precisely, $Y=f(A,B,U)$ becomes random since it is dependent on U, which is random. If we, for simplicity, assume that Y is binary ($Y=\text{true}$ or $Y=\text{false}$), we can talk about $p(Y=\text{true}|A,B)$. We can, for instance, assume that Y is true if competition is restricted. It was shown above that, if we want to do a counterfactual analysis by directly manipulating A and B, it is crucial that A

and B are exogenous. This means that if we assume A and B are exogenous and equal to a and b, we can use $P(Y=\text{true}|A=a,B=b)$ for the counterfactual analysis.⁶⁰⁷ By using the formula for the probability of necessary cause derived in Chapter Five,⁶⁰⁸ and assuming monotonicity,⁶⁰⁹ we can find the probability that A=a is a necessary cause for Y to be true. This is

$$p(A=a \text{ necessary for } Y \text{ to be true}) = \frac{p(Y=\text{true}|A=a, B=b) - p(Y=\text{true}|A=\text{not } a, B=b)}{p(Y=\text{true}|A=a, B=b)}$$

The probability of A=a being a necessary cause for Y to be true is the excess risk of Y being true given a. Let A=a be the presence of an alleged anticompetitive agreement. Even the anticompetitive agreement was not entered into, there might be some probability that the same anticompetitive effects would follow anyway, for instance, if all firms except one firm in the market would go bankrupt and disappear from the market. In that case, the agreement would not have any anticompetitive effect. Thus there might be some outcomes of other circumstances, U, that will eliminate the necessity for the agreement to be anticompetitive.

6.2.2 Economic models

The neoclassical paradigm

Economics is a behavioral science. The basis for economic models is the decisions of individuals. The main domain for economics has traditionally been the study of market behavior; however, the domain of economic analysis has now expended to all areas involving decisions when resources are scarce. The use of decision theory in this study to study antitrust analysis when information is scarce is an example of this.

The aggregated outcome of interaction between individual persons can be used to study group behavior and even macroeconomic measures. Economic analysis can be positive, which is the study of actual behavior and outcomes, or normative, which give normative implications, for instance, for how a market should be regulated. Efficiency, welfare, and distribution are possible standards for the normative analysis.

The current paradigm in economic modeling is the neoclassical framework. The neoclassical approach has its origins from the classical economists. The classical economists include Adam Smith (1723-1790), John Stuart Mill (1806-1873), and Jeremy Bentham

⁶⁰⁷ See Pearl (2009) p. 65 f. and Sloman (2005) p. 5 for a more intuitive approach.

⁶⁰⁸ Chapter 5.2.4. Based on Pearl (2009).

⁶⁰⁹ Y is monotonic relative to A=a means that A=a cannot be a cause of Y=false See Pearl (2009) p. 291 f. This was also described Chapter 5.2.4 above.

(1748–1832). Smith (1776) is probably the most seminal and famous classical contribution to economics. Adam Smith is famous for introducing the concept of an invisible hand that directs commercial self-interested agents in their competition for profits to also serve the society’s interest in welfare and wealth. The neoclassicists, such as Jevon (1871), Menger (1971), Walras (1874), and Marshall (1890) formalized the theories of the classical economists with mathematical models. The mathematical models lay the grounds for the “marginal revolution”, which means to use marginal measures in economic analysis. An imperative tool for this analysis was the differential calculus developed a century earlier. The neoclassical approach was developed further in the 20th century. Contributions such as von Neumann and Morgenstern (1944), Stigler (1952), and Friedman (1953) are seminal in the evolution towards the axiomatic rational choice models used in economics today. von Neumann and Morgenstern (1944) is known, inter alia, for establishing modern game theory, which is crucial for modern neoclassical analysis.

Models based on rational choice decision making do not mean that economists believe that these models are descriptive for the actual decision making of individuals when used in positive analysis. It is an instrumental approach to predict behavior and outcomes.⁶¹⁰ The rational choice approach to positive analysis has been critically addressed by behavioral economists, who have revealed that actual behavior deviates substantially from behavior predicted by the models of rational choice. Behavioral economics is returned to below.

Equilibrium

Deriving equilibriums is an imperative feature of the neoclassical paradigm. Based on the assumptions on the agents’ behavior and the exogenous variables, one can deductively calculate the equilibrium outcome of an economic model or the possible equilibriums if there are several potential equilibriums. For now, assume that we have made enough assumptions to single out a unique equilibrium. We will get back to the problem of several equilibriums in the discussion of game theory below. The equilibrium outcome is determined by the adaption of all the agents in interaction, and might be multidimensional. The equilibrium of a market model may consist of the equilibrium price, the equilibrium quantity, equilibrium profits, and so on. Different equilibrium concepts will be returned to below. For now, the equilibrium is pragmatically considered as a balanced state, and that without any outside “shocks” this state

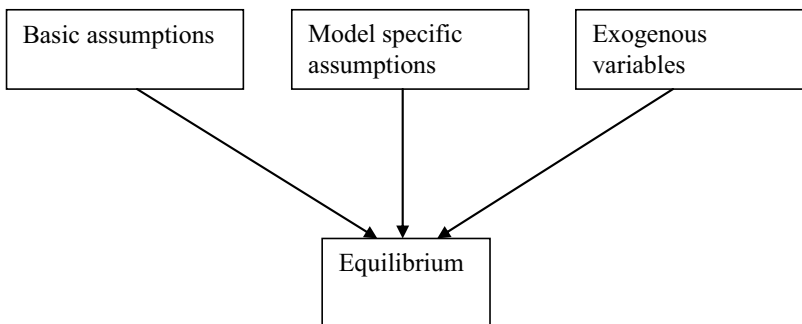
⁶¹⁰ See Friedman (1953). See McKenzie (2010) for a recent discussion.

remains. This means that without any outside “shock”, no agents have an incentive to deviate from their adaption to the current state.

A balanced state does not mean that there are no changes or dynamics, just that the state is stable. For instance, in equilibrium a firm might produce 100 units per year or it might increase its production by 10 percent per year. The equilibrium is simply what we get when we solve equations representing the behavioral assumptions and the exogenous variables. Thus, the equilibrium is found by solving the mathematical equations that models the behavior. When all equations are simultaneously satisfied, we have the equilibrium.

An equilibrium can be stable or unstable. In a stable equilibrium, the dynamics will lead us back to the equilibrium if we, for some reason, are outside equilibrium. This means that if there is some outside “shock”, we might be outside equilibrium for a period; however, eventually we will get back to the equilibrium. An unstable equilibrium means that dynamics will not necessarily lead us back to the equilibrium if we happen to be outside the equilibrium. The determination of the equilibrium in an economic model is illustrated Figure 6.7.

Figure 6.7: determination of equilibrium in an economic model



The basic assumptions of an economic model include, inter alia, the rationality assumptions. In addition to the basic assumptions, model-specific assumptions have to be made. This is necessary to obtain a manageable and solvable amount of equations and to isolate and idealize the situation we want to model. The model specific assumptions might, for instance, consist of assumptions on the customers’ preferences, firms’ production technology, that there will be no entry of new firms, and so on. The assumptions in economic models consist of the explicit assumptions done; however, there might also be lot of implicit assumption that stand without

mentioning. Such implicit assumptions might be that property rights are respected, that agreements are respected, that there is no fraudulent behavior, and so on. Sometimes, it might appear coincidental which assumptions are made explicit and the ones that are implicit. Assumptions that are central for the analysis are usually made explicit and clear. If, for instance, asymmetric information is central to the analysis, assumptions concerning how the information is asymmetric are made explicit. If the possibility of fraud is central to the modeled situation, there will be explicit assumptions as to how the fraud might be performed and so on.

The variables that are determined within the models are the endogenous variables. By comparative statics, one can analyze the effects of changes in exogenous variables. This is what we do when we use economic models for counterfactual and hypothetical scenarios analysis in general. This was described above in the general discussion on the use of models for causal analysis. For instance, one can study the equilibrium effects that follow from changed input prices. The same method can be used to study the effects public interventions and private interventions in the market, such as a cartels and other anticompetitive conduct, as long as they can be described by exogenous variables.

A typical equilibrium in economic analysis is the equilibrium between supply and demand. From the equilibrium between supply and demand, we get an equilibrium price and an equilibrium quantity. The well-known perfect competition model based on the assumptions of, inter alia, atomistic price taking agents, full information, well defined property rights and no transaction costs, predicts an equilibrium price and equilibrium quantity determined by the aggregate demand equaling aggregate competitive supply. Thus, the endogenous equilibrium price p^* is determined by $D(p)=S(p)$, where $D(p)$ is aggregate demand and $S(p)$ is competitive supply. The equilibrium quantity, X^* , is the demand and supply at the equilibrium price, which means $X^*=D(p^*)=S(p^*)$. On the other end of the competition scale is the simple monopoly model where the firm maximizes profits subject to the demand and its costs. Assuming constant marginal costs c , this means that the firm maximizes $\pi=(p-c)D(p)$, where π is the profits .

With imperfect competition and strategic behavior, the models will be more advanced, and calculating the equilibrium will be more complicated. The outcome will depend on the assumption made on strategic interaction between the firms. In this context game theory is a central tool to derive the equilibrium. Game theory and models of imperfect competition are returned to below.

Models of partial equilibrium can be separated from models of general equilibrium. The equilibrium in a market is a partial equilibrium. In a partial equilibrium, many of the variables outside the market in question are considered exogenous. These exogenous variables might be prices of products outside the markets, such as input prices, and the incomes of customers. In a general equilibrium, the equilibriums in all markets are determined simultaneously. From a realism point of view, general equilibrium models might be better because the prices in different markets are not independent of each other. Everything is connected to everything. Many of the exogenous variables in the partial equilibrium model are made endogenous in a general equilibrium model. However, to study the general equilibrium with models, one has to impose so many assumption and simplifications that they might be worthless for inferences at a sophistication level required to be informative for antitrust analysis. Analysis of competition in a market is usually done partially, as these models provide better explanation and prediction than general equilibrium models do. However, this means that variables are considered exogenous for the analysis although they, more realistically, are endogenous. If, for instance, the price of some product which is a close substitute or is complementary to the product in the market we study is considered exogenous, the effects of some competitive changes in the market we study might be very imprecisely predicted.

Game theory and equilibrium modeling

Game theory is about how optimizing agents adapt in the interaction with other optimizing agents. Game theory has been referred to as a unified theory of social science.⁶¹¹ Titles like *“The bounds of Reason: Game theory and the Unification of the Behavioural Sciences”*⁶¹² express an opinion that that game theory can be used as unified model framework in studying behavior and interaction. However, statements like *”[t]his destines game theory to a fascinating footnote in some future text on the history of social theory”*⁶¹³ are not equally optimistic. Game theory is established as a framework for analyzing behavior and strategic interaction in economic models. Game theory is imperative in the contemporary models of imperfect competition.

An equilibrium can be understood as a solution of a game. The equilibrium is a state where no players have anything to gain from playing a different strategy. There are many

⁶¹¹ See for instance Aumann and Hart (1992). If it is assumed that units even at quantum level pursue some goal oriented behavior, game theory could even be considered as a general theory of everything.

⁶¹² Gintis (2009).

⁶¹³ See Hargreaves-Heap and Varoufakis (2004) p. 122.

equilibrium concepts in game theory; the most famous is probably the Nash-equilibrium.⁶¹⁴ In games with incomplete information, the Nash equilibrium is also referred to as Bayesian Nash equilibrium.⁶¹⁵ In Nash equilibrium, no player has an incentive to change strategy given the other players' strategies. A game might have many equilibriums. One of the main challenges of game theory is to predict which of the many equilibriums is the most likely. Thus, in addition to the importance of equilibrium concepts as such in game theory are theories to determine what equilibrium is most likely when a game has many equilibriums. As a game may have many Nash-equilibriums, various equilibrium refinement concepts narrow the number of Nash-equilibriums. Such equilibrium refinement concepts include equilibrium in dominating strategies,⁶¹⁶ trembling hands equilibrium,⁶¹⁷ sub-game perfect Nash-equilibrium,⁶¹⁸ and sequential equilibrium.⁶¹⁹

Some equilibrium concepts are based on more assumptions than other equilibrium concepts. For one who is going to assess model based inferences based on game theoretic equilibriums, it is important to know what assumptions those equilibriums are based on. The foundations for modern game theory established in von Neumann and Morgenstern (1944) were based on rational choice in correspondence with neoclassical economics. The Nash-equilibrium is based on rational choice. Evolutionary game theory, on the contrary, is based on assumptions based on evolutionary dynamics, including natural selection. This section will first briefly discuss the assumptions behind rational choice based game theory, and then evolutionary game theory is returned to.

In the rational choice based game theory, the basic axioms of rationality are obviously important assumptions. The basic assumptions of rationality are complete preferences, reflexivity, and transitivity.⁶²⁰ Furthermore, the rationality assumptions include consistent and coherent assessments of probabilities according the laws of probability. This means that a rational decision is the decision that maximizes expected utility. These assumptions were described in detail in Chapter Three.

⁶¹⁴ After Nash (1950).

⁶¹⁵ See Hargreaves-Heap and Varoufakis (2004) p. 85 f. Usually it is assumed that players can be of different types with different payoff functions associated with the different types in Bayesian games. Bayesian games include so-called signaling games that can have pooling and separating equilibriums.

⁶¹⁶ This is not really an equilibrium refinement concept, but an equilibrium concept on its own. If there is an equilibrium in strictly dominating strategies there is a unique equilibrium which will also be a Nash-equilibrium. See Hargreaves-Heap and Varoufakis (2004) p. 52 f. And Fudenberg and Tirole (1991) p. 61.

⁶¹⁷ After Selten (1961). See Hargreaves-Heap and Varoufakis (2004) p. 81 f.

⁶¹⁸ See Hargreaves-Heap and Varoufakis (2004) p.92 f.

⁶¹⁹ After Kreps and Wilson (1982). See Hargreaves-Heap and Varoufakis (2004) p. 96 f.

⁶²⁰ Hargreaves-Heap and Varoufakis (2004) p. 8 and Varian (1992) p. 95 f.

For some equilibrium concepts, the basic assumptions of rationality are not enough to secure the equilibrium. An assumption that is important for the Nash-equilibrium is the assumption of common knowledge of rationality (CKR). Common knowledge of rationality means that all the players in the game know that the other players are rational. CKR is sometimes divided into different degrees. CKR of degree 1, means that each player knows that the other players are rational. More technically, CKR of degree 1 means that any player, i , knows that another player, j , is rational. CKR of degree 2 means that any player, i , knows that another player, j , is rational, and, in addition, knows that player j knows that player i is rational. CKR of degree n means that each player knows that the other players are rational and knows that the other players know that the first player is rational, who again knowsto the n 'th degree.⁶²¹ This can be continued ad infinitum. Normally, when CKR is assumed it means CKR of infinite degree, which in practice means that all players are rational and know about each other's knowledge of rationality. Related to CKR is the assumption of consistently aligned beliefs (CAB). CAB means that a rational player who knows that the other player is rational can expect the other person to draw the same inferences from information as himself. This assumption is important in finding Bayesian equilibriums in Bayesian games.

In evolutionary game theory, the assumptions of rationality are not necessary. In evolutionary game theory, it will be "genes" that determine a player's strategy. New strategies evolve. Evolution may result from combining existing strategies and mutations. Strategies survive by natural selection. This means that the strategies that have higher payoff have higher survival rates than those with lower payoffs. Thus, the strategies that give the highest payoffs, or highest expected payoffs in the presence of uncertainty, are more likely to survive natural selection. Evolutionary game theory might provide better model framework for behavior where the agents are so simple that it would be absurd to talk about rational behavior, such as interaction between animals, microorganisms and even micro particles. However, it might also explain human behavior, as much of human behavior is based on heuristic and intuition not subject to conscious rational considerations. Evolutionary game theory might also be informative of firms' behavior since firms' behavior often as well can be described as a trial and failure process as calculated rational decision making. Smith (1982) has a similar role to the development evolutionary game theory as von Neumann and Morgenstern (1944) has for the game theory based on rational choice.

⁶²¹ Hargreaves-Heap and Varoufakis (2004) p. 48 f.

An important equilibrium concept used in evolutionary game theory is evolutionary equilibrium, which is an equilibrium in evolutionary stable strategies. Simplified, we can say that an evolutionary equilibrium is an equilibrium of strategies that survives the evolutionary process. A question is if evolutionary game theory can tell us what equilibriums are more likely than other. A Nash-equilibrium that gives all the players a strictly better payoff than playing alternative strategies is also an evolutionary equilibrium. This means that a symmetric equilibrium in strictly dominating strategies is an evolutionary equilibrium. A Nash-equilibrium that is not an evolutionary equilibrium will typically be unstable in the evolutionary dynamics. This means that if a mutation suddenly appears, we might start moving towards another equilibrium or towards an eternal alternating process, never reaching any equilibrium.⁶²²

A serious challenge to the use of game theory as a modeling framework is the problem of multiple equilibriums. Even if there are equilibrium refinement concepts and additional assumptions that reduce the number of Nash-equilibriums we might still be left with a substantial amount of possible equilibriums in a game. The validity of additional assumptions needed to refine the number of equilibriums or to single out a unique equilibrium can often be questioned. If a game theoretic model is used to predict the effects of some change in an exogenous variable, the prediction of a large amount of probable equilibriums will reduce the instrumental value of this model. However, in many models it is only one equilibrium, and game theory models might be more informative for such situations. This applies to many models relevant for antitrust analysis. In many situations, we are not so interested in which equilibrium materializes, but rather what equilibriums may materialize.⁶²³ This will also be the case in many situations where game theory is used in antitrust analysis. In this context, game theory might be instrumentally informative, despite the multiple equilibriums issue.

Game theory based on rational players raises many of the same problems raised against neoclassical economics, as the rationality assumptions might be in serious conflict with realism. Studies in behavioral economics, as mentioned above, have shown that people often make decisions contrary to what seems rational. Experiments have shown that deviations from rationality might give outcomes of games that do not coincide with the equilibrium predicted by the equilibrium concepts in game theory, such as the Nash-equilibrium. Experiments have revealed that players might be concerned with fairness

⁶²² Hargreaves-Heap and Varoufakis (2004) p. 223 f.

⁶²³ However, possibility models may impose a problem for game theory models to be admissible as evidence in US according to the Daubert-standard. This will be discussed below.

trumping objective rationality.⁶²⁴ There have also been experiments where the test-subjects play a prisoners' dilemma game where it is not rational to cooperate. Cooperation still occurs in the experiments.⁶²⁵

Just from the two points made above, one is inclined to believe that the future is not very bright for game theory as a modeling framework. Not only might a large number of potential equilibriums reduce the instrumental value of models based on game theory, but the actual outcomes might very well also contradict with the equilibriums predicted by game theory. Luckily, new research and advances in game theory contribute to a brighter future for game theory. By explicit modeling preferences for fairness, unfair equilibriums can be eliminated from the likely equilibriums. Furthermore, "altruistic" preferences might also be incorporated in the utility function of the players.⁶²⁶ Evolutionary game theory might help us find the equilibriums that are robust to the rationality assumption. This can be used to derive equilibriums that incorporate and accommodate the cognitive limitations addressed by research in behavioral economics. Furthermore, computer simulation of adaptive systems might help us determine which strategies and equilibriums are more likely to occur.⁶²⁷ For instance simulations have shown that the tit-for-tat strategy has a tendency to emerge in repeated prisoners' dilemma games.⁶²⁸ When evolutionary game theory and other methods are used to supplement the rationality-based game theory in deriving more robust predictions on equilibrium outcomes, we can put more confidence in the inferences derived from game theoretical models. This improves the decisions based on such inferences. Most text books in game theory now cover both the rational approach and evolutionary approach to game theoretic modeling.⁶²⁹

Performance and welfare

In economic modeling we are not only interested in modeling economic behavior and finding equilibriums. We also want to assess the outcomes. In antitrust analysis, we are, for instance, not only interested in the new equilibrium in the market following from some conduct under antitrust scrutiny, but also whether this new equilibrium is desirable or not. Economists use welfare analysis to assess the performance of an outcome. Welfare is a general performance measurement that can be decomposed into more precise measurements.

⁶²⁴ See Hargreaves-Heap and Varoufakis (2004) p. 162 for further references.

⁶²⁵ See Hargreaves-Heap and Varoufakis (2004) p. 202 f. for further references.

⁶²⁶ See Hargreaves-Heap and Varoufakis (2004) p. 267 f.

⁶²⁷ Computer simulation of adaptive systems will be returned to below.

⁶²⁸ Axelrod (1984). See also Hargreaves-Heap and Varoufakis (2004) p. 191 f.

⁶²⁹ See, for instance, Hargreaves-Heap and Varoufakis (2004).

A central concept for assessing welfare in an economic context is efficiency. One of the first efficiency concepts introduced to economics students is Pareto-efficiency, named after the economist and social scientist Vilfredo Pareto (1848-1923). A state is Pareto-efficient if no Pareto-improvements are possible. A Pareto-improvement is a change, for instance a redistribution of goods, which has the result that some individuals are better off, while no individuals are worse off. Pareto-efficiency means that it not possible to reallocate goods making somebody better off, without making some others worse off. A Pareto-improvement requires that if some are better off due to some change, they are so much better off that they could compensate those who eventually are worse off, and still be better off after the compensation. A Pareto-improvement also requires that those who are worse off are actually compensated. To actually compensate those who are worse off might not be possible in many cases. If a river is dammed up for electricity generation, this might be a potential Pareto-improvement, but it might be impossible to compensate all those who remotely derive some utility from the river. To implement a potential Pareto-improvement without necessarily providing full compensation to those who lose is often referred to as Kaldor-Hicks efficiency.

Efficiency can be decomposed to different components. It is usual to divide efficiency into consumption efficiency, production efficiency, and efficiency in the composition of consumption and production, also known as allocation efficiency. Efficiency in consumption means that goods are consumed by those that derive highest utility from the consumption, measured by willingness to pay. This means that it is no potential Pareto-improvement associated with redistributing consumption from one person to another. Normally, efficiency in consumption will follow when prices are uniform and there are no restrictions on buying, which means that all consumers face the same price. All who have a willingness to pay higher than the price of the good will then consume it, and it will not be possible to obtain some efficiency gains from redistribution. Efficiency in production means that the production is performed as efficiently as possible. This means that it is not possible to realize an efficiency gain by producing the good in another way, for instance, by another composition of inputs, by choosing another available technology, or by moving the production to another producer. Production efficiency is not necessarily the same as low costs. If, for instance, the costs are reduced by reducing the salaries of the employees, this is not an efficiency gain. The employees are worse off, and it is a redistribution from the employees to the producer. Allocation efficiency means that the right products are produced in the right amount taking into account the costs of production and the consumers' utility. It means, for instance, that

there is a right amount of cars produced relative to planes. The composition of consumption and production will be efficient if price equals marginal costs in all markets, as long as the marginal cost reflects the true alternative cost of production.

Sometimes, static efficiency is distinguished from dynamic efficiency. Static efficiency refers to efficiency at a given point of time. Static efficiency is usually used to assess static models such as the perfect competition equilibrium discussed above. Some models include dynamics, which mean that adaption over time is explicitly modeled. In dynamic models dynamic efficiency can be assessed. Dynamic efficiency is efficiency over time, including efficiency in investment decisions.

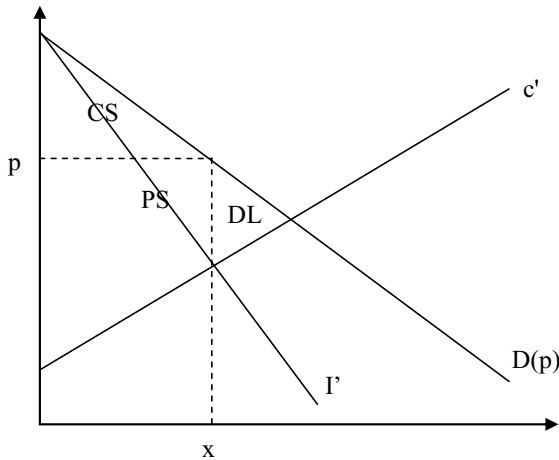
Lack of efficiency involves waste of resources. As a result welfare could be improved. Efficiency means that as much surplus as possible is generated, which can be distributed in the desirable way. “Welfare” in economic analysis has a more precise content than the use of the word in daily language. For a consumer, the welfare from purchasing a good is the increased utility of buying the good minus the incurred resources to buy the good, which, normally, is the price. The difference between marginal willingness to pay and price is the consumer surplus of buying an additional unit of a good.⁶³⁰ The consumer surplus is an approximation of consumer welfare.⁶³¹ For the producer the surplus is the price received from the good minus the resources incurred to make it. This is in other words, the profits. The producer surplus is a measure of producer welfare. The total welfare is the sum of consumer welfare and producer welfare, which is the utility generated from producing a good minus the resources incurred to produce the good. The sum of the consumer and producer surplus is the total surplus, which approximate total welfare. Efficiency is necessary to maximize total welfare. If somebody can be made better off without anybody else becoming worse off, it is possible to increase the total welfare.

⁶³⁰ More precisely consumer surplus is the accumulated differences between marginal willingness to pay and the price paid. This is the area between the demand curve and the price.

⁶³¹ The consumer surplus is just an approximation of the surplus of consuming this particular good. Changes in the consumer surplus serve as a measure for the consumer’s valuation of both price increases and price reductions. Price changes also have an income effect that must be taken into account to get a correct measure of the consumer’s valuation of a price change. To get a correct measure of the consumer’s valuation of a price increase, one could assess how much reduction in income would be equivalent to the increase in price for the consumer to be at the same utility. This is called equivalent variation (EV) in income. This is how much the consumer would be willing to pay for the price not to increase. We could also ask how much the consumer had to be compensated in income for a price increase to stay at the same utility level. This is called the compensating variation (CV) in income and is a measure of how much the consumer must be compensated at current prices to be equally well off after the price increase. In case of a price increase we will have $\Delta CV \geq \Delta CS \geq \Delta EV$. Thus, ΔCS is not an exact measure of the loss to the consumer due to a price increase. A price increase will make the customer a little poorer, which is not fully taken into account. Varian (1992) p. 160 f. provides more details on the relationship between consumer surplus, compensating variation in income, and equivalent variation in income.

Partial equilibrium models can be used for partial welfare analysis. The efficiency and welfare properties of the simple monopoly model are illustrated in Figure 6.8.

Figure 6.8: efficiency and welfare in the monopoly model.



In Figure 6.8, c' is the marginal cost of the monopoly, while $D(p)$ is the demand curve.⁶³² In the outcome of the simple monopoly model, the price, p , is above the marginal cost. The reason is that the monopolist, by increasing the price above marginal cost, will earn more per unit, which will outweigh the loss from reduced quantity sold. By increasing prices, the monopolist will transfer some consumer surplus (CS) to itself as producer surplus (PS). This is a distribution effect. When the price is higher than the marginal cost, we will not obtain allocation efficiency;⁶³³ there are consumers with a marginal willingness to pay higher than the marginal cost. This “sum” of these losses is called the deadweight loss from monopoly, and is illustrated by DL in the Figure 6.8. Increasing production would be a potential Pareto-improvement. If the monopolist could, he would have sold to more customers as long as this would not affect the price charged to the other customers. However, in the simple monopoly

⁶³² The demand curve is how much that will be demanded at a given price, which also measures the marginal willingness to pay at a given price.

⁶³³ According to the theory of second best after Lipsey and Lancaster (1956) we cannot really know if there is allocation efficiency by looking at one market alone. If there are distortions in other markets then a non-competitive price may contribute more to allocation efficiency than the competitive price does. It is the relative prices which are important for efficient allocation of production of different goods. If, for instance, the prices of oranges are supra-competitive, then the “second-best” to competitive prices in all markets might be that also prices of apples are supra-competitive to facilitate an optimal allocation in the production of oranges and apples. This shows some of the problem inferring from partial equilibrium models. See Østbye (2008) p. 47 f. for a further discussion on the theory of second best.

model we assume that such price discrimination is not possible. This assumption can be relaxed in more advanced models, which will be returned to below.

Thus, monopoly leads to allocation inefficiency according to the simple monopoly model. Too little is produced. Furthermore, with monopoly, the competitive forces will not create a selection mechanism towards the most efficient firms in the market. This selection mechanism promotes production efficiency. Thus, monopolies are exposed to so-called X-inefficiency,⁶³⁴ as long as the capital market is not sufficient to secure efficiency in production.⁶³⁵ However, since the price is uniform in the simple monopoly model, we will have efficiency in consumption.⁶³⁶

Conversely to the monopoly model; in the perfect competition model briefly discussed above, there will be efficiency. The competition will force the price to equal marginal cost, as anyone charging a higher price will be undercut by rivals who will make profits at a lower price. Inefficient firms will be forced out of the market by efficient firms, so there will be efficiency in production. Since all consumers pay the same competitive price, there will be efficiency in consumption. Since prices equal marginal costs there will be allocation efficiency.

Above it was performed welfare analysis of the simple monopoly model and the perfect competition model. The same can be done by more complicated models of competition. We would have to calculate the equilibrium and assess the welfare generated in the same way as for the perfect competition model and the monopoly model. As explained above game theory is used to calculate equilibrium in many models of imperfect competition.

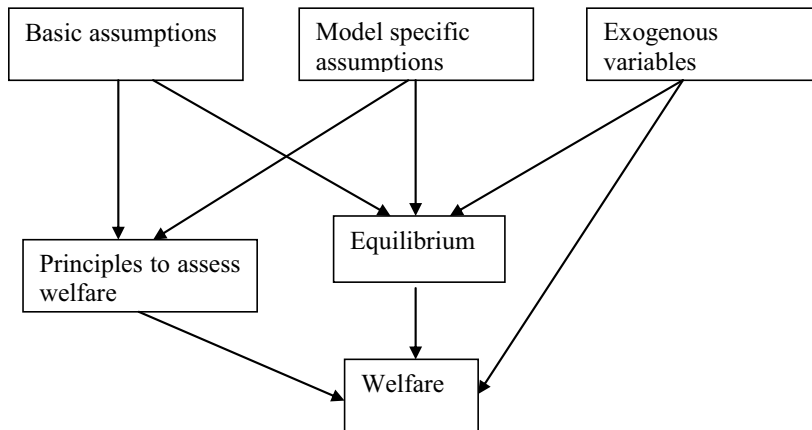
The welfare analysis based on economic equilibrium models is described by in Figure 6.9.

⁶³⁴ From Liebshtein (1966).

⁶³⁵ Owners would normally want efficiency in production to generate as much profit as possible. The capital markets will in theory channel firms to owners who can improve efficiency in production.

⁶³⁶ This might change with price discrimination.

Figure 6.9: welfare analysis in economic equilibrium models



As described above, the equilibrium is derived from the basic assumptions; the model specific assumptions and the exogenous variables. The welfare, as illustrated above, is assessed with the basis in the equilibrium of the models. This means that it is the equilibrium outcome that is used to assess the welfare. It is not so interesting to assess the welfare outside the equilibrium as any state outside the equilibrium is unstable and will last only minimum time. Furthermore, as the process towards the equilibrium outside the equilibrium is not explicitly modeled in most models, we will not know what outcome to use as the basis for a welfare analysis outside equilibrium. One of the critiques of the current neoclassical regime is that there are always shocks in the economy meaning that we are always outside equilibrium. This critique is addressed further below. If this critique is correct, one can ask what the value is to use the equilibrium as the basis of the welfare analysis.

It should also be noted that the model assumptions not only affect the welfare through the equilibrium. Assumptions might directly affect how the welfare is assessed. If it, for instance, is made explicit assumptions on the utility function of the customers and the production technology of the firms, these assumptions will also be of relevance to assess welfare.

Manipulations of exogenous variables can be used to assess effects on equilibrium in a counterfactual analysis, as described above. This can, in turn, be used to assess effects on welfare.

Other model assumptions and principles of economic modeling

The discussion of the basic framework and assumptions for economic modeling above was based on the current neoclassical paradigm of using models of rational choice as an instrumental approach. The neoclassical paradigm has been under attack from many directions. The Austrian school has criticized the neoclassical school's use of equilibriums as a basis for the assessments. The Austrian school stresses the importance of dynamics in economics, which is also the focus of economists advocating evolutionary modeling and biologically inspired models as a basis of economic modeling. Behavioral economics has addressed the lack of realism in using rational choice to model behavior. In this section some of this critique against the neoclassical paradigm and its implications for economic modeling is discussed.

Dynamical aspects of the economy have a central place in the Austrian school of economics. The Austrian school can be traced back to economists such as Carl Menger (1840-1921), Eugen von Böhm-Bawerk (1851-1914), and Friedrich von Wieser (1851-1926), who all were associated the Vienna University before World War I. Other seminal representatives are Ludwig Von Mises (1881-1973) and the Nobel laureate, Friedrich von Hayek (1899-1992).⁶³⁷ For Austrian economists the uncertainty and complexity is in focus. Agents do not adapt to certain circumstances, but must all the time adapt in a world of uncertainty, complexity, and continuous changes. Competition is about being best to adapt. Static efficiency, as described above is of less interest to Austrian economists. Because of continuous shocks and dynamics, the markets are out of equilibrium most of the time anyway. There will always be outside shocks to the markets that prevent the equilibrium to be reached. Those agents who succeed are those who innovate by improving production or introducing new products. The Austrian school has not evolved into a formal system of models like the neoclassical school. This is partly due to the fact that the Austrians themselves did not consider economic science as a framework to give good predictions on the micro-level. Such predictions involve too much uncertainty as the agents' behavior is being governed by too many subjective elements. Austrian economists are more concerned with "general patterns."⁶³⁸

The economist Joseph Schumpeter was educated by the Austrian school, but is usually not categorized as an Austrian economist. It is more usual to speak of Schumpeterian

⁶³⁷ See von der Fehr (1995).

⁶³⁸ McKenzie (2010) p. 93 f.

competition almost as a separate philosophy of competition. One of Schumpeter's most seminal and a well-known contribution is Schumpeter (1943). Schumpeter did not reject neoclassical static analysis, but thought that it was given too much weight. For Schumpeter, monopolies were a prerequisite for innovation by awarding success. Through "creative destruction", old monopolies are replaced by new monopolies. Schumpeter is also known to have stressed the importance of monopolies, or at least market power, to promote innovation. In his early works, Schumpeter was concerned with the innovation by individual entrepreneurs,⁶³⁹ but was later concerned with the innovation in firms. The argument was that monopoly profits are important to finance innovation and to exploiting economies of scale and scope in innovation. In modern neoclassical terms this argument can be explained by imperfect capital markets making monopoly profits a more efficient source of capital for innovation. Capital markets are characterized by asymmetric information, which is the source of a risk premium that is not required if the capital is acquired internally.

A direction that is closely related to Austrian economics and Schumpeterian thinking is evolutionary economics. In the 1980s, this direction boosted even evolutionary models as an inspiration for economic models can be traced back to Alfred Marshall (1842-1924). It can even be argued that evolutionary thinking originated from economics and inspired Charles Darwin's revolutionary ideas in biology (and not opposite). Darwin was inspired by the evolutionary thinking central to the economic and demographical studies of Thomas Malthus (1766-1834). In evolutionary economics, a firm might be viewed as a set of routines (genes). Those with the best routines survive the competition (natural selection). New sets of routines evolve from mutations (new ideas) and mergers. Nelson and Winter (1982) is a seminal contribution to evolutionary economics.

Complexity and complex adaptive systems are closely related to evolutionary economics.⁶⁴⁰ Complex adaptive system can be seen as a method to model evolutionary processes, with more algorithmically-oriented models than those used in evolutionary economics. The complexity research is interdisciplinary and it covers commonalities of all adaptive systems that are subject to evolutionary dynamics, including economic dynamics.⁶⁴¹ The theory of complex adaptive systems has, inter alia, been researched at the Santa Fe Institute since the 1980s. In complex adaptive systems, agents adapt according to different behavioral rules, and those behavioral rules that perform best will survive the evolutionary

⁶³⁹ Schumpeter (1911).

⁶⁴⁰ Complex adaptive system is also referred to as agent based modeling.

⁶⁴¹ See Holland (1996).

process. Other agents might adapt by mimicking those most successful. New behavioral rules are evolved both by combining existing behavioral rules (pairing) and by mutation, which means that new behavioral rules are, partially, evolved according to a random process. Modeling the interactive dynamics of thousands or millions of adaptive agents is very complex and much more computing-intensive than the simple idealistic models of neoclassical economics. However, the introduction of cheap processing power and new computer technology over recent decades has increased the possibilities to model and simulate complex adaptive systems. Thousands of iterations can be run in a computer simulation within a short amount of time.

The analytical model framework used in complex adaptive systems is not necessarily in competition with framework to the neoclassical modeling framework. Kenneth Arrow who was awarded the Nobel Prize in economics and who is a seminal contributor to neoclassical economic theory in the 20th century has, in many contexts, endorsed the insight from complex adaptive systems.⁶⁴² While the neoclassical equilibrium outcomes can be considered the result of an economic process, complex adaptive systems can be used to study the process towards these equilibriums. By analyzing the complex dynamics, we might also find factors that can explain why neoclassical models sometimes do not give good predictions of equilibriums, and, as a result of this, wrong predictions of the outcomes. Both in complex adaptive systems and in neoclassical models, competition is the fundamental force for development. In complex adaptive systems competition for resources is a prerequisite for cooperation and specialization. The agents cooperate to achieve an advantage over other cooperative units. As a biological application, the human body can be seen as a gigantic cooperation between cells to achieve a competitive advantage in the battle with other organisms for resources. On a higher level, humans cooperate in families, firms, countries and other units to gain a competitive advantage.

Another theory closely related to the evolutionary thinking, but that shed some light of imperfections associated with the evolutionary process is the so-called theory of path-dependence, with Arthur (1988, 1989) as seminal contributions. Path-dependence is also known in the biological literature as inertia.⁶⁴³ Arthur was associated with the Santa Fe Institute, and his contributions on path-dependence theories can be seen as a part of the research on complex adaptive systems. Path-dependence provides a theory of how inferior solutions might result from evolutionary processes. Economies on either the supply side

⁶⁴² See for instance the preface in Holland (1996).

⁶⁴³ See Sober (2008) p. 243 f.

(economies of scale) or demand side (such as network effects⁶⁴⁴) may result in a lock-in to inferior solutions. Solutions that once were a result of optimal adaption due to historical circumstances are no longer optimal, but inertia creates a lock-in.⁶⁴⁵ The QWERTY keyboard was once developed to prevent jam in mechanical typewriters, a property not important for keyboards today. The switching costs associated with changing to an optimized keyboard system for today's needs might create inertia towards an inferior keyboard construction that was once superior.

Behavioral economics is related to the evolutionary and adaptive modeling in economics. As explained above, the instrumental approach in the "mainstream" neoclassical paradigm of economic modeling is rational choice. The rationality assumption in mainstream economic modeling has developed from more vague assumptions, such as "maximization behavior" in Friedman (1962) to formal axioms of rationality used in the mainstream approach today.⁶⁴⁶ These axioms were explained above. Behavioral economics address, inter alia, the empirical support of the axioms of rationality. Behavioral economics studies cognitive biases that lead persons to make decisions contrary to what objectively appears rational. The psychologist, mathematician, and economist Daniel Kahneman (1934-) was awarded the Nobel prize in economics for his work in behavioral economics. Much of this work was done together with the psychologist, mathematician, and economist Amos Tversky (1937-1996).⁶⁴⁷

Many empirical studies in behavioral economics have shown how people's behavior systematically deviates from the behavior predicted by the theory of rational choice. Examples of biases are the failure to take alternative costs fully into account, the endowment effect, and a propensity to assess probabilities systematically wrongly.⁶⁴⁸ Some of the cognitive biases relevant for assessing evidence were discussed in the previous chapters of

⁶⁴⁴ The study of network externalities in economics boosted in the 1980s as industries characterized by network externalities and platforms became more important in the economy. Network externalities has now been fully integrated into neoclassical models. Network externalities can be direct in the meaning that the customers' utility of a product increases as more customers use the product. Examples are telephony and Internet. Network externalities can also be indirect in the meaning that as more people use the products, there will be developed more complementary products, which benefits the consumers. An example is that the more people who use a computer operating system the more programs and applications will be developed it. The last example is also an example of a platform good, also called two sided markets, where customers and producers "meet" on the platform (the computer operating system). Early works on network externalities are David (1985), Katz and Shapiro (1985) and Farrell and Saloner (1985), See also Liebowitz and Margolis (1998). See Rochet and Tirole (2003) and Evans (2002) for two sided markets.

⁶⁴⁵ The remnant of a tail in the human body is a biological example.

⁶⁴⁶ McKenzie (2010) p. 1 f.

⁶⁴⁷ Amos Tversky would probably have received the Nobel Prize in economics together with Daniel Kahneman, had Tversky still been alive.

⁶⁴⁸ McKenzie (2010) p. 113 f.

this study. A link from evolutionary models to behavioral economics is that cognitive biases can be considered as a result of evolution because such biases increase the chance of survival. In this argument, cognitive biases are resulting from evolutionary rational irrationality.⁶⁴⁹ Brain activity and decision making are subject to resource constraints. More brain activity is costly both in terms of energy and time. Cognitive biases might be considered as a tradeoff between the increased expected loss of a less informed choice and resources saved by deciding on heuristics rather than rational calculations. For instance, one could imagine the energy and time that had to be incurred to apply the completeness assumption of rationality in actual decision making. This would mean that a person had to rank all possible decision alternatives for every decision. The brain, neurologically, works in a way that some brain processes are automated in the meaning heuristic methods can be exploited for many choices. In this way the human decision activities as such are subject to an economic optimization process.⁶⁵⁰ The studies in behavioral economics have resulted in an extensive debate among economists. Contrary to what many non-economists, and even some economists, seem to think, this is not a debate over whether people actually are rational according to the theory or not, but over what degree rational choice is a sound instrumental basis for economic modeling. Even the most conservative neoclassical economists will probably agree that humans do not always act according to what might, objectively, seem rational. The debate is over which models that are instrumentally best to explain and predict behavior. Let us say that the firms who act most in correspondence with rational choice survive competition. Even if firms' behavior is just a result of adaption, and the "invisible hand" or natural selection eliminate those who adapt less rationally, the theory of rational choice might give a good prediction of which firms survive in the market.⁶⁵¹ However, in other modeling contexts, such as trying to model the outcome of a legal evidence assessment process, taking into account the insight from behavioral economics might provide a better explanation and prediction of the outcome.

A question is if there is some theory that can unite evolution-inspired models and neoclassical models of rational choice. If both these model frameworks have instrumental value and can be used to explain and predict, it seems intuitive that it should be possible to unite the theories in some way. The neoclassical models of rational choice model the

⁶⁴⁹ McKenzie (2010) chapter 7 and 8.

⁶⁵⁰ The field "Neuronomics" studies the function of the brain in an economic context. However the brains ability to economize decisions in a tradeoff between better decisions and use of resources was pointed out by Austrian economists before the neurological construction of the brain was known, see McKenzie (2010) p. 141 f.

⁶⁵¹ See McKenzie (2010) p. 35 f.

interaction between rational agents, while evolutionary models model the outcome after a natural selection of those who adapt best (survival of the fittest). If those who survive are those who adapt closest to rational behavior, we should expect the same outcome. As described above, game theory seems to have found ways to unite rationality based models and evolutionary models. Game theoretic equilibriums based on adaption of rational agents often coincide with the equilibriums predicted by evolutionary game theory. This indicates that game theory as a model framework for modeling interaction among optimizing agents can serve as a unifying model framework from supporters of different approaches to model economic behavior.

A brief history of economic models used in antitrust analysis

When the Sherman Act was new, the neoclassical modeling framework was also quite new and far less developed than today. The lessons from the classical economist were definitely established, including Adam Smith's seminal reflections on the invisible hand leading self-interested suppliers in competition to act in the interest of society. Furthermore, the neoclassical "marginal revolution" was established. The efficiency and distributional aspects associated with monopoly and cartels were also known at the time.

The good properties of competition predicted by the perfect competition model were known to the US antitrust authorities and the perfect competition model was probably a guiding model for the early application of US antitrust law. As explained in Chapter Two, the introduction of the Sherman Act was motivated by various factors. The high prices and market power due to cartels and monopolies, such as the powerful railway cartels at that time, is pointed to as one motivation. Small businesses' fear of big and potentially more efficient business is another motivation.⁶⁵² The benefit of small, independent, competing suppliers as assumed in the perfect competition model accommodates both those motivations as a guiding model for the application of antitrust law. Low barriers of entry and small independent businesses should be promoted if the model of perfect competition should guide antitrust enforcement.

However, the benefits of an atomistic structure as assumed in the perfect competition model were not uncritically accepted as a guiding model for antitrust enforcement. In the late 19th and early 20th century, the exploitation of economies of scale was a popular topic amongst the contemporary economists, and big companies and trusts were seen by leading

⁶⁵² See Hovenkamp (2005) p. 48 f.

economists as a solution to exploit economies of scale.⁶⁵³ Some more advanced models of competition were also available already during the early enforcement of antitrust law. The Cournot-model of oligopoly was developed by Cournot (1838) and was criticized by Bertrand (1883). Both of these models utilize methods that were later formalized in game theory. Both the Cournot-model and Bertrand models are still influential in antitrust analysis. The model of a dominant firm with a competitive fringe was discussed already in Forchheimer (1908) and continues to inform antitrust.⁶⁵⁴

The model of perfect competition, the monopoly model, the Cournot and Bertrand oligopoly models, and the model of a dominant firm with a competitive fringe were theoretical bases for the so-called SCP-paradigm, also called the SCP-model. The SCP-paradigm was the established mainstream theory applied in antitrust analysis for a long period, until it finally came under substantial critique by the Chicago School in the 1970s. SCP is an abbreviation for Structure-Conduct-Performance. The SCP-model has the basis in a one way causal link from structure to conduct to performance. The structure determines the conduct, which, again, is determining for the performance. Extensive empirical research was done from the 1940s onwards to shed light on and to develop the SCP-model further. Seminal contributions were made by the economist Joe Bain, including Bain (1968). A more theoretical contribution, but still within the SCP-paradigm, was made by Chamberlin (1933). Chamberlin used the Cournot-model as a modeling framework, but is also known for introducing models of monopolistic competition. This model use differentiated products as a basis, and it predicts the establishment of new differentiated products as long as it contributes to increased profits. The suppliers of new differentiated products become a “monopoly” for their own differentiated products, and entry will occur as long as this monopoly profit is positive and covers the fixed costs. Chamberlin also suggested the introduction of time in the analytical framework, which would allow for tacit collusion between competitors. Tacit collusion allows higher prices than non-cooperative prices do. This was later shown formally in models using modern game theory. This is further addressed below. It should be noted that the EU competition policy entered into force during the SCP-paradigm. The SCP-paradigm was an established framework that was ready to be applied in the EU enforcement of

⁶⁵³ See Hovenkamp (2005) Chapter 2.1 and 2.2.

⁶⁵⁴ Blair and Kaserman (2009) relies on this model to inform antitrust analysis. The model is, however, normally given scarce attention in the contemporary industrial organization literature.

competition law. It should be noted, however, that *ordo-liberal* ideas,⁶⁵⁵ usually associated with the Freiburg School, had a strong influence on the German competition laws developed concurrently with the EU competition rules.⁶⁵⁶ This is likely to have had some influence on the theoretical economic foundation of EU competition policy in addition to the SCP-paradigm imported from US.

The theoretical direction of microeconomics, which developed simultaneously with the SCP-paradigm, flourished together with the general research on the theory of rational choice and game theory such as von Neumann and Morgenstern (1944). Economists associated with the University of Chicago pioneered this research. This theory did not get a foothold in the economic modeling framework applied in antitrust analysis at the time. This, however, was about to come to an end with the Chicago school critique.

Many of the most influential economists of the 20th century were associated with the University of Chicago. Chicago economists are known for advocating free markets with minimal public interventions. This can be traced back to, *inter alia*, Knight (1921). Nobel laureate in economics, Milton Friedman, worked both on the theoretical foundation for microeconomics and advocated liberal ideas. Seminal works include Friedman (1953, 1962). The Nobel laureate in economics, George Stigler (1911-1991), was also associated with the University of Chicago. Like Friedman, Stigler worked on the theoretical foundation of microeconomics in addition to seminal contributions in political economy and the theory of regulation. Stigler's textbook in price theory came in first edition in Stigler (1952) with extensive revisions through to the last edition in Stigler (1987).⁶⁵⁷ The Nobel laureate in economics, Ronald Coase (1910-), and the Nobel laureate in economics, Gary Becker (1930-), who were also associated with University of Chicago, are seminal contributors, if not founders, of the field of law and economics.⁶⁵⁸ Becker is probably best known for extending the neoclassical model framework of rational choice outside the market context such as in law, regulation and politics. Coase is best known for the economic analysis of property rights and transaction costs. This, particularly, includes the Coase theorem, which says that, with

⁶⁵⁵ *Ordo-liberalism* emphasizes the role of government in preserving competition to limit growth of concentrated power. This was particular a reaction to the former Nazi government whose power was partially built on an industrial-government complex of concentrated powers. See for instance Lyons (2009).

⁶⁵⁶ See Lyons (2009).

⁶⁵⁷ Another early Chicago-school contribution is Director and Levi (1956).

⁶⁵⁸ The much earlier utilitarian Jeremy Bentham (1748-1832) was also concerned with topics coinciding with modern law and economics.

well-defined property rights and no transaction costs, efficiency will result independently of the initial distribution of property rights.⁶⁵⁹

The Coase theorem tells us that it is not lack of competition and other deviations from the assumptions of the perfect competition model that are the source of inefficiency in the economy. It is improperly defined property rights and transaction costs. This can be illustrated by the monopoly model. Monopoly is not a problem as such, but transactions costs are. The monopoly has an incentive to sell to all customers who have a marginal willingness to pay higher than marginal costs. The problem is that it is too costly to negotiate terms with every single customer. When the monopoly has to set one price for all customers, it will be optimal to set the price higher than marginal cost with the deadweight loss as a result as shown above. The same applies to other inefficiencies following from the lack of competitive pressure. Owners are interested in as much profits as possible, and thus in efficient production, even if they are owners of a monopoly. The problem is that transaction cost makes it difficult to make perfect contracts giving the proper incentives for the management and other employees to produce efficiently. The management and employees have incentives to keep as much surplus from the production themselves. This incentive problem is a basis for X-inefficiency.

The Chicago-school's skeptical attitude towards public regulations, including antitrust interventions, and the lesson from Coase on the impact of well-defined property rights and transaction costs were probably important factors behind the substantial critique of the contemporary application of antitrust laws that came from Chicago school, which started in the 1960s and peaked in the middle of the 1970s.⁶⁶⁰ Seminal contributions include Posner (1976) and Bork (1978). One main issue of critique was the contemporary application of antitrust laws towards vertical agreements and vertical mergers, which are restraints between firms on different levels on the production chain. Examples of vertical agreements are exclusive dealing, exclusive distribution agreements, and vertical restrictions on price, such as retail price maintenance. The argument of the Chicago-school was that there is only one monopoly profit to gain. A monopoly producer cannot increase its monopoly gains by, for instance, integrating with a purchaser or giving a purchaser exclusivity. In fact, a monopoly producer gains from competition on the distribution level. Competition limits the opportunities for the distributor to keep the monopoly profits for himself. Efficiency explains

⁶⁵⁹ Coase (1960).

⁶⁶⁰ This is sometimes referred to as the second Chicago-school as a further development of the first Chicago-school developed by the economists of the University of Chicago from the 1940s, cf. Martin (2007). In antitrust contexts the term Chicago-school is often associated with the Chicago-school critique in the 1970s.

why a producer would sacrifice the benefit of competition by vertical integration and vertical restraints according to the Chicago-school critique. The Chicago-school pointed at the possibility of vertical integration and vertical restraints as tools to repair efficiencies due to improperly defined property rights and transaction costs. For instance, competition between retailers might chill the retailers' incentives to promote a product as the promotion might partly benefit other retailers of the same product. This might result in an inefficient amount of product promotion. If a retailer is given exclusive rights to distribution in an area, this retailer will achieve all the gains at retail level from promotion in this area. Thus, a "property right" to the gains from investments in promotion is established. The Chicago school also challenged one of the cores of the SCP-paradigm, which is the casual chain from structure to conduct to performance. A firm may succeed and becomes large due to superior efficiency and innovation. In this case, it is the performance that determines the structure.

The message from the Chicago-school is that markets perform best with minimal intervention. Regulations restrict competition, including most antitrust interventions.⁶⁶¹ The role of the government should be to provide for well-defined and enforceable property rights, and to reduce the size of transaction costs. The Chicago-school has had a great impact on US antitrust policy from the 1970s and onwards,⁶⁶² especially the antitrust policy of republican regimes. It also had an impact, albeit to a lesser extent, on the application of EU competition laws. The ordo-liberal influences on the foundations for European competition policy have probably influenced the inertia for the acceptance of Chicago-school economics.

The critique from the Chicago-school showed that there was a need for revising and updating the models used to aid inferences in antitrust analysis. The problem was not the lack of theory. The theoretical direction of microeconomics had, for a long time, developed advanced models on industrial organization based on rational choice and game theory. Major contributors were economists associated with the University of Chicago, as explained above. An example is Stigler (1968). The problem was that this theory was not adopted in applied antitrust analysis, and was not the approach in the mainstream industrial organization literature. This changed in the 1980s. Economists who were educated in this new theory started to dominate academic positions and academic journals. The economists hired by the antitrust authorities were of this new school.⁶⁶³ The articles and textbooks applying rational

⁶⁶¹ The title "The Antitrust paradox: A policy at war with itself" of Bork (1976) is illustrative. The antitrust laws themselves, at least if they are applied incorrectly, restrict competition.

⁶⁶² A seminal decision in this context is *Cont'l T.V., Inc. v. GTE Sylvania Inc.*, 433 U.S. 36 (1977).

⁶⁶³ See Kobayashi (1996).

choice and game theory to industrial organization and antitrust economics grew substantially. One of the first textbooks that had a focus on game theory and rational choice in industrial organization was Tirole (1988). The Chicago-school arguments were modeled and analyzed. Models utilizing game theory showed that the Chicago-school had to be modified and that some of the old lessons from the SCP-paradigm had merits, despite the Chicago-school critique. Game theoretical models showed, for instance, that vertical restraints and vertical integration might have anticompetitive effects depending on the circumstances.

Thus, from the late 1980s, the rational choice and game theoretical models started to dominate the mainstream industrial organization theory and were used as the theoretical modeling framework informing antitrust analysis. This is sometime referred to as the post-Chicago approach.⁶⁶⁴ Earlier models such as the models of Cournot (1838) and Bertrand (1883) were formulated and developed further within a formal game theoretical framework. Only imagination was the limit for antitrust-relevant problems and situations that were scrutinized by this model framework. A survey of the various models applicable for antitrust analysis can be found in the text-book literature in industrial organization and antitrust economics.⁶⁶⁵

Despite disputes between economists concerning the realism and instrumental value of the different models of competition discussed above, they are all within the neoclassical modeling framework. Critiques from other economic schools have not had a substantial impact on antitrust analysis, even though other schools have given more weight to dynamical aspects and innovation than the neoclassical school (although *ordo-liberal* ideas had some influences on the foundations of EU competition policy as mentioned above). Since the neoclassical school does not provide such clear explanations and predictions on dynamical aspects as on static aspects, one should believe that other theories would have been more welcomed to assess dynamic aspects relevant for antitrust analysis. Nevertheless, such influence has been limited. This may be about to change. Newer theories have shown merits in unifying neoclassical economic models with other theories.

The Austrian school of economics described above has not to a significant extent found its way as a model framework for applied antitrust analysis. This is partly due to the fact that the Austrian economists themselves consider economics as a discipline unsuitable to give predictions at the micro level. Austrian economists are more concerned with general

⁶⁶⁴ See, for instance, Kobayashi (1996) and Lipsky (2003).

⁶⁶⁵ See, for instance, Belleflamme and Peitz (2010).

patterns.⁶⁶⁶ The Austrian economics approach to antitrust would probably be to be reluctant to interfere in the economy with antitrust interventions because there are no good micro-level theories identifying which interventions that would improve performance. The risk that beneficial dynamical competition is altered is substantial. If interventionist prudence for dynamical reasons is credited to the Austrian school, then the Austrian school has had some influence, as many influential scholars have advocated such prudence for dynamical reasons.⁶⁶⁷ Schumpeter's arguments and theories, which are closely related to the Austrian school, have found their way to applied antitrust analysis and have probably had some influence on the application of antitrust law. Schumpeterian arguments on economies of scale in innovation are repeatedly alleged as a defense in merger control.⁶⁶⁸

Evolutionary models and complex adaptive systems modeling were described above as complementary ways of modeling economics to the neoclassical framework. It is difficult to say what implications it would have for antitrust analysis to increase the use of evolutionary models and complex adaptive system as a basis for model based inferences. An evolutionary implication of antitrust analysis would be to preserve the diversity, but still not prevent desirable evolution. As a recognized failure of evolutionary dynamics is undesirable path dependence, and the competition rules have a role in preventing this. An example is that the problem of network externalities is recognized in antitrust analysis, and this theory has informed many cases such as the Microsoft cases in the US and EU.⁶⁶⁹ It should be mentioned that network externalities has now been fully integrated into neoclassical models.

The competition models used for antitrust analysis today are mainly based on rational choice. Insight from behavioral economics has not yet had a major impact on industrial organization models applied in antitrust analysis. This might, however, be changing.⁶⁷⁰ Taking into account insight from behavioral economics might improve the information value of models relevant for antitrust analysis. This might, in particular, be relevant in assessing competition aspect where the consumers processing of complex information is especially relevant for consumer decisions, for instance, where advertisement is important for consumer choice.⁶⁷¹

⁶⁶⁶ McKenzie (2010) p. 93 f.

⁶⁶⁷ See for instance Easterbrook (1984).

⁶⁶⁸ See Whish (2009) p. 802 f. See also EU horizontal merger guidelines op.cit. Section 81 and US Horizontal Merger Guidelines op.cit. Section 10.

⁶⁶⁹ See Belleflamme and Peitz (2010) p. 581 f.

⁶⁷⁰ See, for instance, Stucke (2007).

⁶⁷¹ See for instance Tor (2004).

One area where behavioral economics can be said to have some impact on antitrust analysis is in the area of product bundling. Some firms have been considered to have a dominant position in after-markets despite tough competition in the original markets.⁶⁷² Both US antitrust law and EU competition law recognize the possibility of market power in the aftermarket, despite competition in the original market.⁶⁷³ A theoretical example of such markets might be the game-console markets where the competition between console producers might be tough. After the purchase, the consumer is locked in to proprietary games. A rational consumer would rationally take the possibility of being locked in and exploited into account at the original purchase. If so, the possibility of exploiting market power in the after-market would be competed away in the original market.

For an antitrust decision maker, it is probably smartest to be pragmatic to economic models. The neoclassical framework is the current paradigm for models in antitrust analysis. However, if other models have higher informative value, it would be a waste to not utilize the informative value of these models to produce more accurate antitrust decisions. Those who apply non-standard models will probably have to overcome skepticism and must be prepared to give a good explanation as to why their models provide a higher informative value than the standard models do. In the US, the first barrier for presenting economic analysis is to pass the Daubert standard to be admitted as evidence in court. The Daubert standard applied to economic models will be discussed in more detail below.

6.2.3 Inferences from economic models in antitrust analysis

This subchapter offers a brief description of the roles of economic models in making inferences in antitrust analysis. Thus, it will be described how economic models can support the actual components of antitrust analysis. How the economic models are actually assessed in antitrust analysis will be discussed in detail later in this chapter.

Economic models in the determination of rules

Economic models are central to all aspects of antitrust law. Antitrust analysis, as defined in this study, consists of the determination of antitrust law and the assessment of evidence. It was described how economic models have had a strong impact on the determination of

⁶⁷² A US example is *Eastman Kodak v. Image Technical Servs.*, 504 U.S. 451 (1992). An EU example is *Hugin v Commission Case 22/78 ECJ* (1979).

⁶⁷³ For a description of US antitrust law, see Hovenkamp (2005) p. 402 f. For an EU law approach see Whish (2009) p. 727 f. It should be noted that the rationality argument has been argued by defendants in after-market antitrust cases. In both US and EU law there must be some circumstances that at least complicate the rational calculations when buying the original product. Thus, behavioral economics has not been applied in these cases without careful considerations.

antitrust rules in Chapter Four. An example from the US is the influence of the Chicago School on the development of the presumption rules applied in the US. A landmark decision is *GTE Sylvania*,⁶⁷⁴ where the Supreme Court expressed a new direction in the handling of vertical restraints, and also in establishing the pursuit of consumer welfare as a goal of antitrust. Another example is *Leegin*,⁶⁷⁵ where the Supreme Court abandoned the per se treatment of minimum resale price maintenance. In the EU it is also not difficult to find examples of how economic models have been decisive in the determination of rules. An example is the *Airtours*⁶⁷⁶ decision, where the court established a treatment of collective dominance more aligned with economic theory. Another EU example, though at the legislation level, is the substantial revision of the merger regulation framework leading to the present merger regulation (EMR), which entered into force 1 May, 2004.⁶⁷⁷ In the new regulation, the standard was changed from the dominance test to the SIEC-test (Significant Impediment of Effective Competition). A reason was that the dominance-test was alleged to not include mergers between non-dominant companies that still were likely to be harmful from an oligopoly theory point of view.⁶⁷⁸

Economic experts are normally not allowed to provide witness testimony about what a rule is.⁶⁷⁹ An economic expert is, for instance, not allowed to offer witness opinion on whether price fixing is per se prohibited or not. This means that judges, in principle, must rely on their own knowledge of economics when economic models are used in the determination of rules. This is a truth with modification, though. As described in Chapter Three, it is often not a clear distinction between the determination of rules and the assessment of evidence in antitrust analysis. An example of this is the use of presumption rules both to distinguish per se and rule of reason in US antitrust law, and conduct that restrict competition by its object and according to its effects in EU competition law. Presumptions are a mechanism of evidence assessment. It is also often not a clear distinction between the determination of rules and the assessment of evidence when some particular conduct, such as a vertical restraint, is scrutinized in antitrust analysis. Both the legal methodology applying precedence and analogy and an economic assessment of the specific conduct, can be used to scrutinize the legality of the agreement. It is not obvious where the determination of the rule ends and the assessment

⁶⁷⁴ *Cont'l T.V., Inc. v. GTE Sylvania Inc.*, 433 U.S. 36 (1977).

⁶⁷⁵ *Leegin Creative Leather Prods, Inc. v. PSKS, Inc.*, 551 US 877 (2007).

⁶⁷⁶ *Airtours plc v Commission of the European Communities* Case T-342/99 [2002].

⁶⁷⁷ Council Regulation (EC) No 139/2004 of 20 January 2004 on the control of concentrations between undertakings (the EC Merger Regulation) Official Journal L 24, 29.01.2004, p. 1-22.

⁶⁷⁸ See Whish (2009) p. 853

⁶⁷⁹ Posner (1999b)

of evidence starts. Thus, even if economic experts are called upon to provide opinions on the economic impact of the conduct in question as a matter of evidence assessment, their opinions are also likely to influence the decision makers' determination of the rule to be applied.

Economic models in the assessment of antitrust evidence

The second component of antitrust analysis is evidence assessment. Model based inference is central in the assessment of antitrust evidence. As explained in Chapter Three and Chapter Five, economics has a particular role as a forensic science in antitrust cases.⁶⁸⁰ This means that economic expert knowledge is used to assess the facts of the case. When economic models are used as a forensic tool in antitrust evidence assessment, the models are often calibrated with real world data. The economic models are then supported by statistical and econometrical methods in providing inferences.

Economic expert knowledge can enter its way to antitrust evidence assessments in various ways.⁶⁸¹ The decision makers may refer to external expert knowledge to support their differences. This might include reference to economic theories with or without reference to relevant journal articles. A US example is *Bell Atlantic*,⁶⁸² where the Supreme Court stated that

*[t]he inadequacy of showing parallel conduct or interdependence, without more, mirrors the ambiguity of the behavior: consistent with conspiracy, but just as much in line with a wide swath of rational and competitive business strategy unilaterally prompted by common perceptions of the market. See, e.g., AEI-Brookings Joint Center for Regulatory Studies, Epstein, Motions to Dismiss Antitrust Cases: Separating Fact from Fantasy, Related Publication 06-08, pp. 3-4 (2006) (discussing problem of "false positives" in §1 suits.*⁶⁸³

Here, the court refers to economic research to support their argument. Moving to EU an illustrative decision is the decision of the European Commission in *Microsoft*⁶⁸⁴, where the Commission, inter alia, makes references to contemporary research on network effects. This theory is also discussed in the court decision.⁶⁸⁵ The economic expert knowledge may also be provided by economists that are included procedure as expert witnesses, or in other ways

⁶⁸⁰ See also Schinkel (2008) and Lianos (2010).

⁶⁸¹ See Lianos (2010).

⁶⁸² *Bell Atlantic Corp. v. Twombly* 550 U.S. 544 (2007).

⁶⁸³ *Bell Atlantic Corp. v. Twombly* 550 U.S. 544 (2007) at 254.

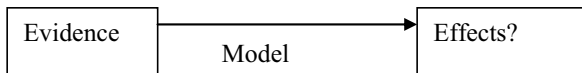
⁶⁸⁴ Case COMP/C-3/37.792 *Microsoft* [2004],

⁶⁸⁵ *Microsoft Corp v. Commission*, Case T-201/04, CFI, [2007]. However, the court did not cite academic authorities explicit. This is not usual for the EU courts, see Lianos (2010).

provide advice to the courts.⁶⁸⁶ The use of economic experts in antitrust procedure will be discussed further below.

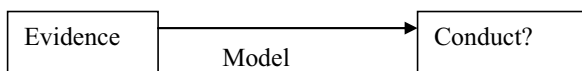
Economics models can assist antitrust evidence assessment in two major ways. Firstly, economic models can assist in assessing the effects of some undisputed conduct, for instance a merger or an agreement between companies. Other evidence, such as market shares, can then be used as inputs to the models. By applying the evidence as input in the model we can use the model to predict effects. This is illustrated in Figure 6.10.

Figure 6.10: using models to predict effects



Secondly, models are also relevant to assess the likelihood of some unknown illegal conduct, such as a secret cartel. A model can be used to assess the likelihood of some specific evidence given the two alternative hypotheses that the illegal conduct happened and that the illegal conduct did not happen. An example is that it is observed parallel conduct from two companies over long time. A model of the market can help assess whether the parallel conduct is more consistent with some illegal coordinated behavior than not. In other words, we can assess the probative force of some evidence within the model. This is illustrated in figure 6.11.

Figure 6.11: using models to explain evidence



Thus, by the terms used in the beginning of this chapter models are both used to explain and predict in the assessment of antitrust evidence. When models are used to assess whether the evidence is more or less consistent with some illegal conduct or not a model is used to explain the evidence. It is then assessed as to whether the evidence present is likely to be explained by a model of the conduct under scrutiny. For instance, if we observe parallel

⁶⁸⁶ Lianos (2010).

behavior we can see how well this evidence is explained by a model of illegal coordinated behavior compared to models that do not involve such illegal behavior. If models are used in this sense, the models applied must necessarily be based on realism. That some model of illegal behavior is instrumentally able to predict evidence is not enough. If a model of illegal behavior explains some evidence better than other models, then the underlying truth must also be that the evidence is more consistent with illegal behavior. When economic models are used together with real world data, econometric methods can be employed to make statistical inferences about how consistent data are with the hypothesis of illegal behavior. One can, for example, analyze whether some parameter representing illegal behavior is statistically significant. The use of statistical inference is further discussed below in the subchapter on rationality in model-based inferences.

When models are used to predict the consequences of some conduct, instrumentalism is a major role of the models. A model that more accurately predicts the effects of some conduct is more useful than a more realistic model that predicts the consequences less accurately. This means that checking the empirical validity of the assumptions are less important as long as the model predicts well.⁶⁸⁷ If, for instance, an assumption of individual rationality can be questioned on empirical grounds, this model may still work well if individuals, on average, behave rationally. If models used for prediction are calibrated with data the consequences can be predicted quantitatively. This means that the parameters are estimated, and the estimates are used for prediction. Thus, in addition to the statistical testing of the parameters of the model, the statistical testing of the prediction itself becomes important. One can, for instance, test whether some prediction of anticompetitive effects is statistically significant. Statistical testing is discussed further below in the subchapter on rationality in model-based inferences.

Dealing with models in antitrust

As described in the introduction to this chapter, models can be more or less informative. A model is a more or less good substitute for knowing the truth. Many models can be applied on the same evidence. Competing models may yield different inferences. Thus, there is uncertainty related to the use of models. This means that a decision maker must take into account the uncertainty associated with models. Just picking a model that seems suitable might lead to disastrous results. The subchapter on rational model-based inferences below

⁶⁸⁷ Stressed by Friedman (1953). See also McKenzie (2010) and Lianos (2010).

will deal with the question of how to rationally address uncertainty to obtain rational model-based inferences. This will be used as a benchmark to assess the performance of the actual assessment of economic models in antitrust analysis.

The analysis that follows will focused on the use of models in antitrust evidence assessment. However, the determination of antitrust rules is, to a large extent, about the determination of presumption rules, as explained in Chapter Four. The determination of presumption rules belongs analytically to evidence assessment. Thus, the discussion in the rest of this chapter is also relevant for the determination of antitrust rules.

6.2.4 Economic models and the Daubert standard

The Daubert standard

In US antitrust trials, economic experts are often involved in the litigation as expert witnesses. This means that economists provide an expert opinion in the court based on their economic expert knowledge. This involves, inter alia, providing testimony on inferences based on economic models to support the assessment of evidence. In the US experts may, unlike lay witnesses, present inferences from evidence (opinions).⁶⁸⁸ This power to testimony on inferences based on expert knowledge is under control by the Daubert standard established in *Daubert*.⁶⁸⁹ The court stated in *Daubert* that, before an expert testimony is accepted as admissible, the court must make

*a preliminary assessment of whether the reasoning or methodology underlying the testimony is scientifically valid and of whether that reasoning or methodology properly can be applied to the facts in issue.*⁶⁹⁰

For acceptance, the

*overarching subject is the scientific validity--and thus the evidentiary relevance and reliability--of the principles that underlie a proposed submission. The focus, of course, must be solely on principles and methodology, not on the conclusions that they generate.*⁶⁹¹

⁶⁸⁸ Federal Rules of Evidence, Rules 701 and 702.

⁶⁸⁹ Established in *Daubert v. Merrell Dow Pharmaceuticals, Inc.* 509 U.S. 579 (1993). *Daubert* was about scientific evidence. In *Kumho Tire Co. v. Carmichael* 526 U.S. 137 it was established that *Daubert* also applies to "testimony based on 'technical' and 'other specialized' knowledge".

⁶⁹⁰ *Daubert v. Merrell Dow Pharmaceuticals, Inc.* 509 U.S. 579 (1993).

⁶⁹¹ *Daubert v. Merrell Dow Pharmaceuticals, Inc.* 509 U.S. 579 (1993).

The court refused to give any definitive checklist or test to accept an expert opinion but provided some general factors for the court to consider. These are:

1. *“whether a theory or technique is scientific knowledge that will assist the trier of fact will be whether it can be (and has been) tested.”* In this context, the court referred to the philosophy of science literature stating that “[s]cientific methodology today is based on generating hypotheses and testing them to see if they can be falsified”;
2. *“whether the theory or technique has been subjected to peer review and publication”;*
3. *“in the case of a particular scientific technique, the court ordinarily should consider the known or potential rate of error”;*
4. finally, the court stated that *““general acceptance” can yet have a bearing on the inquiry. A “reliability assessment does not require, although it does permit, explicit identification of a relevant scientific community and an express determination of a particular degree of acceptance within that community.”[...].”*

Thus, the court requires scientific validity for expert testimony to be accepted. For this relevance and reliability is required. Important factors in this context include the testability of the theory or technique, peer review and publication of the theory or technique, the potential rate of error if a particular technique is used, and the general acceptance of the theory or technique. Daubert refers to the science concept established by the philosopher of science Karl Popper.⁶⁹² Popper stressed the possibility of falsification as imperative in determining whether something qualifies as science. Daubert was about scientific evidence. In *Kumho*⁶⁹³ it was established that the principles established in *Daubert* also applies to testimony based on “technical” and “other specialized” knowledge”. Thus, regardless of whether the application of economic models is considered scientific or not, the Daubert standard guides the admissibility of such evidence. The Daubert standard is now partially implemented in Federal Rules of Evidence Rule 702.

The Daubert standard for expert testimony to be admissible has several justifications. The Daubert standard is a barrier for “junk science” to enter the court.⁶⁹⁴ A primary justification is that it prevents decision makers, in particular laymen jurors, being confused

⁶⁹² Popper (1959).

⁶⁹³ *Kumho Tire Co. v. Carmichael* 526 U.S. 137

⁶⁹⁴ See Posner (1999, 1999b) and Lianos (2010).

and giving weight to meritless expert testimony.⁶⁹⁵ For laymen jurors, it might be difficult to distinguish “junk science” from “real science”, and there is a risk of being persuaded by false experts who do not deserve to have the privilege to provide opinion as experts. The Daubert standard can also be justified by cost considerations as it saves the costs associated with the presentation of meritless expert testimony. However, such a justification can be questioned as substantial resources may be involved in the procedure surrounding the Daubert motion.⁶⁹⁶

However, the Daubert standard can also be criticized. At a post-modernistic superior level, “general acceptance” can be said to protect the application of the established sciences and hence the ruling powers in the application of law. At least the standard can be said to protect the established paradigm of a science, for instance the established paradigm of economics.⁶⁹⁷ Note, however, that “general acceptance” is not an absolute requirement, but a factor to take into account. This was, in fact, one of the main issues in *Daubert*, as the earlier standard from *Frye*⁶⁹⁸ was based on general acceptance as a requirement.⁶⁹⁹ Furthermore, the reliance on Popper’s concept on testability and falsification can create a distortion towards those sciences that are testable. This implicates a preference for sciences that can be tested with standard methods of statistical inference. “Holistic sciences” relying on the influence of a number of interconnected factors where each factor cannot be tested independently, will have a disadvantage.⁷⁰⁰ An interesting observation by Lianos (2010) is that Popper’s concept of science does not itself satisfy the Daubert standard. Thus, the courts rely on a concept of science that does not satisfy the criteria for being a science itself.

The admissibility of expert evidence is not so strict regulated in the EU Commission’s enforcement of the competition rules as it is in the US. An explanation with relevance for proceedings in the EU courts is that the EU courts mainly rely on court-appointed experts that can be screened before they are appointed.⁷⁰¹ A more general explanation is that the

⁶⁹⁵ Posner (1999, 1999b). See also Lianos (2010).

⁶⁹⁶ See for instance Werden (2008).

⁶⁹⁷ See also Lianos (2010) for a discussion.

⁶⁹⁸ *Frye v. United States*, 293 F. 1013 (D.C. Cir. 1923).

⁶⁹⁹ See Kaye (2001) for a discussion.

⁷⁰⁰ This can be illustrated by an example outside antitrust. According to the current paradigm of drug testing, experiments testing the effects of drugs involve two test groups where the test subjects are picked by random selection. The test subjects do not know if they get the real medicine or placebo. The reason is to find the genuine effect of the medicine. This testing principle provides a disadvantage for developers of drugs who claim that it is the drug together with the psychological influences that gives it its effect

⁷⁰¹ ⁷⁰¹ Rules of Procedure of the Court of Justice of the European Communities of 19 June 1991 (OJ L 176 of 4.7.1991, p. 7, and OJ L 383 of 29.12.1992 (corrigenda)) article 47 and Rules of Procedure of the Court of First Instance of the European Communities of 2 May 1991 (OJ L 136 of 30.5.1991, p. 1, and OJ L 317 of 19.11.1991, p. 34 (corrigenda)) article 70. See Lianos (2010). See also the discussion on the use of neutral experts below.

professional decision makers in the EU Commission and the EU courts are better suited to distinguish junk science from science compared to the laymen jurors used in US jury trials. Nevertheless, steps have been taken to improve the scientific level in the use of economic expert evidence in European Commission. The Commission employs PhD-level economists in the chief economist team. Thus, if there ever was a time where the economics expertise of the European Commission were lawyers with sufficient self-confidence to appear as economists, this time is gone. Furthermore, the Commission has produced best practices on the submission of economic evidence.⁷⁰² These best practices are supposed to facilitate good methodology in the use of economics in evidence assessment. These guidelines are revisited in the discussion on the actual assessment of economic models below. Furthermore, the courts seem to have been well suited, at least in some cases, to challenge the Commission if the Commission has not based its analysis on sound economic methodology. An example of that is the *Airtours*⁷⁰³ decision discussed in Chapter Five.⁷⁰⁴

The nature of economic models and Daubert

There is a growing body of literature addressing the application of Daubert standard to the use of economic experts in antitrust cases.⁷⁰⁵ The question is what is required for an economic expert testimony to satisfy the Daubert standard. This literature addresses the compatibility of the Daubert standard with the nature of economic models as such, and issues related to the use of econometrical and statistical methods. This section addresses the topics related to the nature of economic models as such, while econometrical and statistical issues will be returned to in the next section. After this a discussion will follow.

A characteristic of economic models is that they are of a deductive character. Based on the model assumptions and some exogenous variables, one equilibrium or several possible equilibriums can be deducted. On its face, this is just mathematics. It is easy to “test” whether valid methods of deduction have been applied. The potential rate of error of the model as a mathematical exercise can easily be calculated. If the model is deductive without any probabilistic elements, then there are no errors, and if the model includes stochastic variables, the probability of different outcomes can be calculated. Furthermore, the deductive methods

⁷⁰² DG Competition, Best Practices For The Submission of Economic Evidence and Data Collection in Cases Concerning the Application of Articles 101 And 102 TFEU and in Merger Cases, Staff Working Paper.

⁷⁰³ *Airtours plc v Commission of the European Communities* Case T-342/99 [2002].

⁷⁰⁴ See Geradin and Petit (2010). The courts seem to have been keener to review the economic methodology applied by the commission in cooperation and merger cases, but not in abuse of dominance cases.

⁷⁰⁵ See, for instance, Blair and Herndon (2000), Werden (2008), Coate and Fischer (2009) and Lianos (2010). See also Hovenkamp (2005b).

used in mathematics are generally accepted. Thus, *prima facie* it seems that economic models should have no problems passing the Daubert standard. It is mathematics, after all, the most exact of all sciences.

It is not so easy, though. It has been argued that mathematics is not science in the Popper sense and thus not complies with the Daubert standard.⁷⁰⁶ The reason is that mathematics as such is not falsifiable. The requirement of testability and knowledge of the potential rate of error requires something more than that the models are mathematically correct. The models must be valid and thus reliable and relevant for informing the facts in question. Expert evidence must, as all evidence, be relevant. This means that the one who wants to provide economic expert evidence also must show that the economic model applied by the expert has relevance in informing the particular case. The requirements for expert knowledge to be relevant for informing the case have been a returning issue in practice. The relevance issue will be discussed further below.

A usual attack on economic models is the use of assumptions. There have been cases where economic expert testimony has been rejected because the model was based on assumptions not relevant for the case. An example is *American Booksellers Association*⁷⁰⁷ where the appeal court found that the expert testimony was inadmissible because the economic model used to assess damages was speculative contained too many assumptions and was not supported by real-world evidence.⁷⁰⁸ Although, such assumptions are likely to have influenced the validity of the testimony in this case, the attack on assumptions is interesting on general grounds. The logic of attacking a model for its assumptions is dependent on the purpose of the modeling effort. If the purpose of the model is to explain evidence, then the realism of the model is important. Then, the assumptions must have some real world justification for what it explains at least if the explanation is sensitive to the assumption.⁷⁰⁹ However, it is in the nature of economic modeling to make simplifying assumptions, and attacking assumptions for lack of realism is not necessarily meritorious if the purpose of the model is instrumentalism. Models based on the assumption of rational behavior may be informative for predictions, even if it can be proven that there are deviations from rationality in the real world. When the purpose is prediction it should be evidence of the model's instrumental value, which means that it must be evidence of the model's ability to predict the

⁷⁰⁶ See Lianos (2010) for the discussion.

⁷⁰⁷ *American Booksellers Association Inc. v. Barnes & Noble, Inc.*, 135 F. Supp. 2d 1031 (2001).

⁷⁰⁸ See Lianos (2010) for a discussion.

⁷⁰⁹ This is a question of robustness that will be returned to below.

relevant variables. Thus, in applying Daubert on the expert testimony based on economic models, the purpose of the modeling should be taken into account. To the author's knowledge the difference between realism and instrumentalism in economic modeling is not well explored in legal practice regarding the application of the Daubert standard.

A challenge for economic expert testimony based on inferences from economic models has been alleged to be the possibility nature of economic models. This is related to the multiple equilibrium issue of economic models. This, in particular, applies to the use of game theory.⁷¹⁰ A merger model might, for instance, state an increased possibility of oligopolistic coordination as an equilibrium outcome. Coate and Fischer (2009) stress the challenges associated with testing and eventually falsifying possibility models. Without testing the relevance of these models to a particular market, the models boil down to pure mathematics. Thus, Coate and Fischer (2009) seem to mean that the informative power of these models must be empirically tested in the market studied in each case to comply with the Daubert standard. On the other hand, the authors seem to mean that the basic neoclassical models, which mean those not based on game theory such as the monopoly model, have more empirical support, and can be applied more generally.

Coate and Fischer (2009) are criticized by Lianos (2010). Lianos points out that the basic neoclassical models of competition and monopoly do not have the general empirical support alleged by Coate and Fischer (2009). Furthermore, Lianos (2010) points out that Coate and Fischer (2009) seem to confuse "tested" with "testability", where the last part is essential for some theory to qualify as science in a Popperian sense. It is not necessary that the model actually has been tested for the case in question for its application in the specific case. It must be testable, though. The distinction between testable and tested was an issue for the appeal court in *United States v. Mitchell*⁷¹¹ that seems to apply a testable-standard based on the grounds that testability is necessary for the possibility of cross-examination.⁷¹²

Lianos' position in this debate seems correct. The main requirement for qualification as a science according to Popper is testability and not whether a theory actually has been tested on the facts in question. However, the theory becomes stronger as it survives more and more falsification attempts. The validity of an economic model can normally not be completely verified. The informative power of a model is partially dependent on what alternatives we have for making inferences. A model that has not been empirically tested on

⁷¹⁰ See Kobayashi (1997) and Coate and Fischer (2009).

⁷¹¹ *United States v. Mitchell* 365 F.3d 215 (3d Cir. 2004).

⁷¹² See Kaye (2005) for a discussion.

the facts of the case in question is better than no model at all. What is important is that it is provided some justifications that the model is relevant to inform the case. It would not be rational to base a decision on absolute ignorance just because the model has not been fully empirically tested. What is required for a model to be relevant to inform the case is returned to in the discussion below.

Statistical and econometric analysis and Daubert

The use of statistical and econometrical methods raises particular questions regarding the compliance with the Daubert standard.⁷¹³ Statistical methods are, as such, mathematics. The statistical methods are based on the basic principles of calculus and the probability calculus that can be derived from the axioms of probability in Kolmogorov (1950). By making some assumptions on the properties of stochastic variables, the statistical properties of some statistics can be calculated. A statistic is a combination of stochastic variables. The current paradigm of statistical testing is frequentism, although Bayesian methods are also applied.⁷¹⁴ The frequentistic approach means that inferences about parameters are based on the likelihood of observations under some particular assumptions on the statistical properties on the observations. Simplified, the frequentistic methods of testing are based on the principle that if some observations are too unlikely given some model assumptions and some assumptions on the parameters tested, then the assumptions of the parameters are rejected. For instance, if we toss a coin 100 times and get heads 100 of the times, this will be such an unlikely outcome of a fair coin that we reject a hypothesis that the coin is fair. In frequentistic methods, conventions have been established as to how unlikely the observations must be before some assumption is rejected.⁷¹⁵ The rationality of these conventions will be discussed in the rationality of model-based inferences below.⁷¹⁶ A point to make here is that the statistical methods are themselves mathematics and the validity of the conventions applied to reject hypotheses are themselves not testable. This means that the statistical methods as such used for testing, falsification, and to find error rates are not themselves suitable to be tested against the Daubert standard. Still, the basic methods of statistics, such as multiple regression analysis

⁷¹³ An in depth study is Kaye (2001).

⁷¹⁴ See Sober (2008), Chapter 1 and Gilboa (2009) Chapter 4.

⁷¹⁵ Such as 5 or 10 percent significance levels.

⁷¹⁶ In Bayesian methods, we are allowed to assign a priori statistical properties to the parameters as such, and new observations are used to update the probability distribution of the parameters. The problem is then how the subjective a priori element in the calculation is determined. This will be discussed in more detail in the subchapter on rationality in model-based inferences below.

have been accepted as established reliable methods.⁷¹⁷ Thus, it is the application of these methods on facts in the case that must pass the Daubert standard, not the statistical methods as such.

There have been several situations where statistical and econometrical analyses have been declared inadmissible according to the Daubert standard in antitrust cases. One example is *Lantec*⁷¹⁸ where an expert testimony was declared inadmissible inter alia on the grounds of unreliable data. Another example is *Aluminum Phosphide Antitrust Litigation*⁷¹⁹ where the expert testimony was rejected because the regression analysis failed to address the causality issue at question. The main task of the application of the Daubert standard seems to be to declare inadmissible statistical and econometrical analyses that are based on unreliable data or where statistical methods are applied in a way that do not inform the case. Even if, for instance, multiple regression is admissible as an applicable method, an analysis based on this method is inadmissible if it does not properly address the issue it is supposed to inform.

A particular issue is to separate methods and conclusions in the application of the Daubert standard to statistical and econometric analyses. It is the methods that are subject to Daubert screening and not the conclusion. Kaye (2001) suggests that the Daubert-standard applies to the major premise in a chain of inference, while the minor premise is a conclusion. This is easiest to illustrate outside antitrust. Assume that a statistical analysis is used as evidence for a substance's harmful effect on persons. A general statistical analysis showing the harmful effect of the substance on persons would be the major premise that is subject to the Daubert standard. However, using this analysis as evidence that using the substance resulted in the harmful effect on person A would be a conclusion. This analytical approach may work well as a general rule, but it is not hard to see that this will not solve the problems associated with the application of the Daubert standard on statistical analyses. A question is for instance how close the link between the major premise and the minor premise should be. Is an experimental study showing effects on rats sufficient as a major premise to conclude effects on humans?⁷²⁰ Furthermore, as pointed out by Kordana and O'Reilly (2001), distinguishing the major premise and minor premise is particularly difficult in econometrical analysis. Where is the border between the general analysis of data as a major premise and the application of the model to a specific market, which would be a conclusion? Thus,

⁷¹⁷ See for instance *City of Tuscaloosa v. Harcros Chemicals, Inc.*, 158 F.3d 548 (11th Cir. 1998).

⁷¹⁸ *Lantec, Inc. v. Novell, Inc.*, 306 F.3d 1003 (10th Cir. 2002)

⁷¹⁹ *Re Aluminum Phosphide Antitrust Litigation*, 893 F. Supp. 1497 (D. Kan. 1995)

⁷²⁰ This was an issue in *General Electric. Co. v. Joiner*, 522 U.S. 136 (1997).

distinguishing between method and conclusion may not be very informative in applying the Daubert standard to econometric analysis. Probably, it is better if the judge applies the Daubert standard to the entire analysis and decides if the analysis is sufficiently linked to the case to have any informative value. The requirement of such a link between a model and the specific case will be discussed in the next section.

Some comments on the application of the Daubert standard to economic expert testimony

The major role of The Daubert standard applied to expert testimony based on economic models in antitrust cases is to provide a check that the expert testimony has some relevance to resolve the case, and that it is reliable in doing so. In Daubert it was established that it must be established that it is a “*fit*” between the testimony and the facts of the case.⁷²¹ This is also established in FRE Rule 702, which states the requirement that “*the expert has reliably applied the principles and methods to the facts of the case*”. This connection between the facts of the case and the testimony was qualified by the US Supreme Court in *General Electric*:

*nothing in either Daubert or the federal Rules of Evidence requires a district court to admit opinion evidence that is connected to existing data only by the ipse dixit of the expert. A court may conclude that there is simply too great an analytical gap between the data and the opinion offered.*⁷²²

Thus, expert testimony based on economic models must be linked to the specific facts of the case. If a model is not calibrated with data in an econometric analysis, it must at least be established that the model has some relevance in being informative for the case. An economic expert testimony based on an economic model not being calibrated with case-relevant data might still be admissible as long as the relevance for the case can be established. An economic model presented as a pure tautology would not be admitted, though. In other words, a mathematical model with tailored assumptions to yield a desired result would not be admitted. However, if it can be demonstrated that the assumptions of a model are relevant for the case and it is informative for the decision makers, for instance, how rational agents are likely to adopt in a certain situation, there seems to be no problem in admitting such testimony as long as it is clear what the testimony is about. For instance, if the party can demonstrate that a model of oligopoly is informative for the case under scrutiny, and this

⁷²¹ Daubert v. Merrell Dow Pharmaceuticals, Inc. 509 U.S. 579 (1993) at 591.

⁷²² General Electric Co. v. Joiner, 522 U.S. 136 (1997) at 146

model reveals that some conduct facilitates a multiple of coordination equilibriums among rational players, it is difficult to see that this evidence should be excluded as long as it is clear what this evidence is supposed to demonstrate. Some assumptions are probably efficient to apply without requiring testing in the specific case for being admissible, as they provide the best default that best can be refuted by the opposite party if they do not apply. If, for instance, a model is based on the assumption that a firm under scrutiny maximizes profits, this is such a reasonable default that it should be up to the other party to justify that this assumption is not likely to give valid inferences for the case in question.

When econometric evidence is presented, the Daubert standard seems to be suitable in distinguishing junk from science. If the data used are not representative, the Daubert standard seems to be applicable to screen out the testimony based on this data. If the methods applied are not informative for what it is supposed to be informative for, but, for instance, an attempt to make correlation appear as causation, the Daubert standard also seems applicable to screen out this evidence. Thus, the courts seem to be applicable to address both of the two major issues that influence the relevance and reliability of quantitative analyses: the data and the application of the quantitative methods on the specific case.

The risks associated with the Daubert standard are that it screens out relevant evidence that should be admitted or fails to screen out evidence that is not relevant. The general impression from some leading antitrust commentators seems to indicate that the problem is that too much passes the Daubert standard rather than too little.⁷²³ The literature refer to several cases where non-meritorious economic expert evince have passes the standard, where a prominent example is the *Conwood*⁷²⁴ decision, which will be discussed in more detail below.⁷²⁵

However, there that also been arguments that the Daubert-standard is too strict. As mentioned above the standard can be criticized for favoring established paradigms. Lianos (2010) points out that the Daubert standard may exclude evidence based other theories of competition not based on the neoclassical framework. This not only has the effect that theories with potential merits may be excluded, but also distorts the development of economics as an academic discipline. It is hard to fully agree with Lianos (2010) on this point. It seems unlikely the Daubert standard constitute a major obstacle for the development of alternative economic theories as such. In fact, the model framework applied in antitrust today

⁷²³ See Hovenkamp (2005b) p. 84 f.

⁷²⁴ *Conwood Co. v. United States Tobacco Co*, 290 F. 3d 768 (6th. Cir 2002).

⁷²⁵ See Hovenkamp (2005b) p. 84 f. and Kaye (2001).

was developed even the SCP-paradigm was the prevailing model framework used in antitrust at the time of development.⁷²⁶ Furthermore, disciplines such as behavioral economics have evolved and gained acceptance despite of the Daubert-standard. As described in the section on economic models above, Nobel Prizes in economics have been awarded for advances in behavioral economics. That a model is based on behavioral economics is no intrinsic obstacle to passing the Daubert-standard in antitrust cases.⁷²⁷ Rather, behavioral economics is on the way into the courtroom in antitrust cases.⁷²⁸ Note, however, that empirical testing is in the nature of behavioral economics, which probably make behavioral economics particularly suitable to pass the Daubert standard. Thus, the Daubert standard seems to not provide a major barrier for new knowledge of economics to enter the courtroom as long as the new knowledge is testable and has gained some general acceptance.⁷²⁹

Understanding the informative value of models seems imperative for the application of the Daubert standard to have any value. The standard should facilitate the admittance of economic models that are informative and that are likely to contribute to a more accurate decision, while confusing analyses that increase the noisiness of evidence should be screened off. This should be an overarching principle guiding the application of the Daubert standard. The rest of this chapter will provide guidance on this issue. The determinants for an economic model to be informative will be identified, and directions for how this informative value rationally should be taken into account will be provided. It will also be discussed when argumentation based on economic models are likely to be confusing and non-informative, in particular by the means of abuse of rhetoric.

6.3 Rational model based inferences in antitrust analysis

6.3.1 Decision theoretic framework for rational model-based inferences

The decision theoretic model framework for rational model-based decisions presented in this chapter builds on the model framework derived in Chapter Three and the extension of this framework presented in Chapter Five. For the sake of completeness, the model framework for

⁷²⁶ However, it should be mentioned that the current framework entered antitrust before the Daubert decision.

⁷²⁷ See Stucke (2007) for a discussion.

⁷²⁸ Stucke (2007).

⁷²⁹ As a note, the Daubert standard may, rather, be a benefit for the development of competing economic theories. If the proponents of such theories want the theories to be applied in legal decision making, they must demonstrate that their models are operational and informative in supporting actual decision making. Forcing the research in this direction might facilitate a beneficial gravity of the theories to be operational and informative for decision making. To improve economic decision making is, after all, one of the major roles of economic science.

rational evidence assessment is briefly recapped here, as incorporating model-based decisions is a direct expansion of this framework.

From Chapter Three, it follows that a rational decision is the decision that maximizes expected utility, which is the same as minimizing expected loss.⁷³⁰ It is rational to decide violation if the expected loss of wrongfully deciding violation is less than the expected loss of wrongfully deciding not violation.⁷³¹ Let L_V be the loss of wrongfully deciding violation (type-1 error). L_{NV} is the loss of wrongfully deciding not violation (type-2 error). p_V is the probability that the law was actually violated, and $p_{NV}=1-p_V$ is the probability that the law was not violated. This means that the expected loss of finding violation is $EL_V=(1-p_V)L_V$. This is the expected loss from type-1 error. The expected loss of not finding violation is $EL_{NV}=p_V L_{NV}$. This is the expected loss from type-2 error. The rational decision is to decide violation if $EL_V < EL_{NV}$ and not violation otherwise.⁷³² This means that it is rational to decide violation if $(1-p_V)L_V < p_V L_{NV}$. The expected loss is then $EL = \min[EL_V, EL_{NV}] = \min[(1-p_V)L_V, p_V L_{NV}]$. The precise content of these losses was discussed Chapter Three.

As explored in Chapter Five, evidence can be introduced into the model framework above. We can think of assessing evidence as hypothesis testing. Let H_V be the hypothesis that the law is violated. This means that the probability of violation can be written as $p_V = p(H_V \text{ is true}) = p(H_V)$. The probability that the law is not violated can be written as $p_{NV} = p(H_V \text{ is false}) = p(H_{NV})$. Since $p_{NV} = 1 - p_V$, we have $p_{NV} = 1 - p(H_V)$.

Let \bar{E}^{Tot} be the total amount of potential evidence that can be gathered. Let \bar{E} be the evidence that is gathered, and let e be the evidence actually observed. This means that e is the outcome of \bar{E} . When we gather evidence \bar{E} we can both choose what evidence to gather and in what sequence to gather the evidence. If e is relevant evidence, it affects the probability assessment of H_V . $p(H_V|e)$ is the probability we assign to H_V given evidence e . In an antitrust context e might for instance be some e-mail from company A to company B on planned price changes, and H_V is the hypothesis that it has been an illegal agreement on price.

⁷³⁰ This can be derived from the axioms of rational behavior. An intuitive explanation is that this is the decision rule that minimizes losses in the long run.

⁷³¹ As explained in Chapter Three, two extreme decisions are assumed: violation and not violation. This is a simplification. Both violation and not violation might consist of many decisions. Violation can constitute a continuous space of decisions. If deciding violation involves fines or other sanctions, every possible size of the fine or sanction is a separate decision. When it comes to deciding not violation, this might also involve many decisions. This can involve an acquittal, which just means that a violation is not found according to the standard of proof. However, the decision maker can also in some circumstances state explicitly that the conduct in question is not a violation. The binary decision framework is chosen for simplicity. This will, most of the time, be illustrative for the study of rationality. If this framework is deviated, this will follow clearly from the text.

⁷³² More precisely it is rational to decide violation if and only if $EL_V \leq EL_{NV}$. However, if we assume that if the expected loss of deciding violation and not violation is equal, then not violation will be decided.

We do not know the outcome of the evidence gathering before it is gathered. If for instance e is written communication of prices we can search for this evidence. If we find this evidence, it might boost our probability assessment of H_V . Not finding the evidence might also have some impact on our probability assessment of H_V , but not so much as if we found the evidence of written communication. In line with rational decision theory, we assume that we know the a priori the probability of finding such evidence if we search for it. This means that we know the probability distribution for $p(\bar{E})$ for all possible subsets of \bar{E}^{Tot} . Even if we, for instance, don't know if we will find communication if we search for it, we at least know the probability of finding such evidence. We also know how this evidence potentially affects our probability assessment of H_V . This means that, for a given outcome of evidence e , we can calculate $p(H_V|e)$.

For some given evidence e , it will be rational to find violation if $EL_V(e) < EL_{NV}(e)$. Given evidence e we have that $EL_V(e) = (1 - p(H_V|e))L_V$ and $EL_{NV}(e) = p(H_V|e)L_{NV}$ which makes it rational to find violation if $(1 - p(H_V|e))L_V < p(H_V|e)L_{NV}$. The expected loss of a rational decision given evidence e is then

$$EL(e) = \min[EL_V(e), EL_{NV}(e)] = \min[(1 - p(H_V|e))L_V, p(H_V|e)L_{NV}].$$

Gathering evidence is also associated with costs. It is assumed that the cost of gathering evidence is $c(\bar{E})$ and this cost is known a priori.⁷³³ A rational decision which includes evidence gathering minimizes the sum of all costs. This is the sum of the expected losses from errors and the costs of gathering evidence. The minimization of the sum of the expected loss from errors and costs of gathering evidence can then be written as:

$$\text{Min}_{\bar{E}} E_{\bar{E}}(EL(\bar{E}) + c(\bar{E})).$$

Since $EL(\bar{E})$ is equal to $\min[1 - p(H_V|\bar{E})L_V, p(H_V|\bar{E})L_{NV}]$, this becomes

$$\text{Min}_{\bar{E}} E_{\bar{E}}(\min[(1 - p(H_V|\bar{E}))L_V, p(H_V|\bar{E})L_{NV}] + c(\bar{E})).$$

The idea behind this formula is simple although it might appear complicated. There are two minimization operations. Given that some evidence, e , is gathered, the rational decision maker

⁷³³ In theory we could assume that there was some uncertainty associated with the costs, and then operate with expected values. This is a complication that is not pursued in this study.

will minimize expected loss. But before the evidence is gathered, he has to “average” over all possible outcomes of \bar{E} by taking the expectation when he is deciding to gather the evidence or not. This is the $E_{\bar{E}}$ part. The $\text{Min}_{\bar{E}}$ refers to the decision maker having to optimize the evidence gathering, taking the cost of gathering evidence into account. Evidence should be gathered if its decision value exceeds the costs, as explained in Chapter Five.

Now models can be introduced into the framework.⁷³⁴ Assume that a model, M , is used to make inferences about $p(H_V|e)$. We let $p(H_V|e, M)$ be the probability of violation, given that model M is “true”. Thus, if we assume that model M is “true”, we can state our expected loss and cost minimization problem as

$$\text{Min}_{\bar{E}} E_{\bar{E}}(\min[(1-p(H_V|\bar{E}, M))L_V, p(H_V|\bar{E}, M)L_{NV}] + c(\bar{E})).$$

The model determines the probative force of evidence, the expected loss of error, and, following from that, the evidence that should be gathered. If it, for instance, is assumed that a Bertrand oligopoly model of differentiated products is the model that describes the market in question, then this model will guide the evidence assessment. This model will determine the probative force of evidence, the decision value of evidence and the optimal gathering of evidence. Note that, in principle, models are also used to assess the loss of errors as pointed out in Chapter Three. This complication is not pursued here. Models can also be used to assess the costs of gathering evidence, which is also a complication not pursued here.

The problem, now, is that the decision is model dependent. Different models might give different rational decisions. By choosing the model, we can choose the expected errors from our decision and, in practice, choose which decision minimizes expected loss. As will be described further below, this might be convenient for a person who argues for a particular decision, but not for making a rational decision. To accommodate the problem of model dependence, we have to take into account model uncertainty to make rational decision based on models. Taking into account model uncertainty gives us the following expected loss and cost minimization problem:

$$\text{Min}_{\bar{E}} E_{\bar{E}}(\min[\sum_i (1-p(H_V|\bar{E}, M_i))L_V, \sum_i (p(H_V|\bar{E}, M_i))L_{NV}] + c(\bar{E})).$$

⁷³⁴ See Parmigiani and Inoue (2009) p. 209 f. and Sober (2008) p. 78 f. for a more detailed description of the framework use here.

$p(M_i)$ is the probability that model M_i is the “true” model. “True” is written in apostrophes because what a true model is depends on whether we have a realism or instrumentalist approach to modeling. How we should interpret $p(M_i)$ is a part of an extensive philosophy of science debate not fully described here.⁷³⁵ In a realism approach, we can think of $p(M_i)$ as the probability that M_i is the actual model that generated the data. In an instrumentalist perspective, we can think of $p(M_i)$ as the probability that M_i is the most informative model among the i candidate models. This topic is returned to below.

The model-dependent expected loss of the decision should be averaged over all models to make a rational decision. The probability that a hypothesis is true averaged over all models is $p(H_V|e) = \sum_i p(H_V|e, M_i) p(M_i)$. If models disagree in the probability of H_V given e , which means that the probative force is sensitive to the model, and if there is no model that appears much more likely to be true than the others, the expected loss of error increases. The reason is that this will create a tendency for $\sum_i p(H_V|e, M_i) p(M_i)$ to neither be very high nor very low. Thus, our decision becomes better if models “agree” upon the probative force of evidence.

In the next two sections of this subchapter, the rational assessment of $p(M_i)$ is discussed. The first section discusses qualitative methods, while the next section address quantitative methods of assessing $p(M_i)$. Thus, it is discussed what weight to rationally give competing models. We will also touch upon the assessment of $p(H_V|e, M_i)$ although $p(M_i)$ is the main focus. However, the rational assessment of $p(H_V|e, M_i)$ follows the principles discussed in Chapter Five. The purpose of this subchapter is to provide a rational benchmark for the discussion of the actual assessment of economic models in antitrust analysis that will follow later in this chapter.

6.3.2 Qualitative assessment of the informative value of models

Principles for qualitative assessment of models

One question is if it is possible to say anything general and qualitative about which models are good and which models are not good, or even bad. Below, this issue is approached with quantitative statistical methods. However, we can say something in general about which models are good or bad on qualitative grounds.

In philosophy of science Occam’s razor, also called the principle of parsimony, is a guide to model assessment and model selection. Applying Occam’s razor is to choose the

⁷³⁵ See Sober (2008) p. 78 f.

simplest model in the choice between two models equally (or almost equally) consistent with observations.⁷³⁶ Models are equally consistent with observations when they explain or predict the observations equally well. The simplest model is normally the one with the fewest explanatory variables. The reason behind Occam's razor is that, with enough explanatory variables, almost any model can fit the evidence. By making sufficient assumptions ad hoc, almost any model can fit the observations.

Note that Occam's razor also can be considered as a tradeoff. Fewer variables might weigh up for less consistence with observations. This means that even if the simpler model performs a little worse in fitting observations than a more complicated model, the simplicity of the simple model might make it better overall. The quantitative techniques to formally weigh explanatory and predictive power against parsimony in variables will be discussed in the discussion of quantitative methods below.

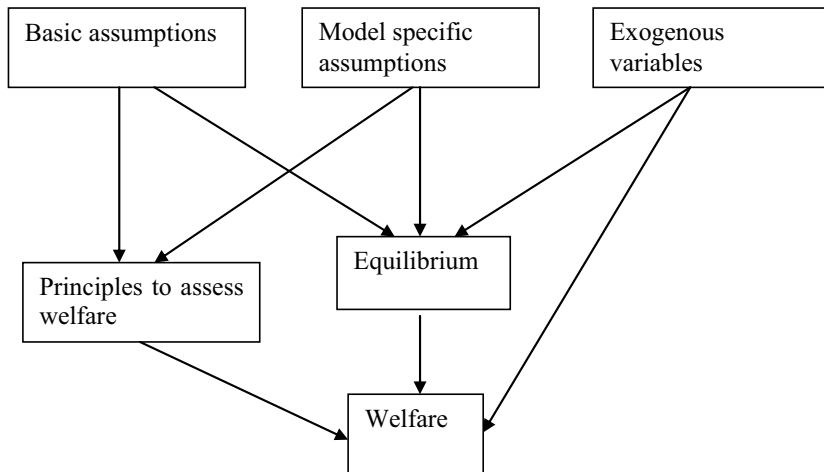
Another way to qualitatively assess the goodness of models is to qualitatively assess the robustness of the model. A model is robust if its explanatory power and predictive power is insensitive to the assumptions made. If the model's explanatory and predictive power is heavily dependent on some assumptions, it is not robust with respect to those assumptions. The point is that if the model is sensitive to such assumptions and we are using it to predict or explain in a situation where we do not know if these assumption are satisfied, the model is not very reliable. However, if the model is not so sensitive to those assumptions, we do not need to worry so much if the assumption is satisfied. Thus, all else being equal, parsimony in assumptions is better. Examples and the quantitative aspects of robustness are returned to below.

Qualitative assessment of economic models in antitrust analysis

As described in the subchapter on economic models above, the use of an economic model to make inferences can be described by a figure as in Figure 6.12.

⁷³⁶ See for instance Pearl (2000) Chapter 2; MacKay (2003) Chapter 28; Sober (2008) p. 78 f.; and Gilboa (2009) p. 21 f. This is in line with Albert Einstein's famous quote "Make it as simple as possible, but not simpler".

Figure 6.12: economic modeling framework



The basic assumptions will typically include fundamental assumptions such as rational choice. If game theory is used to model the behavior, the assumptions of rational choice may be supplemented by assumptions such as common knowledge of rationality and consistently aligned beliefs. From these assumptions, we can derive basic behavioral implications such as profit maximization and utility maximization. Basic assumptions also include implicit assumptions on the economic framework, such as protection of property rights, enforceable contracts, and so on. The basic assumptions are often implicitly given, and are not stated explicitly, unless it is the impact of a basic assumption as such that is explicitly studied in the model. For instance, the possibility of fraud is often assumed away in the models of competition relevant for antitrust analysis. In addition to the basic assumptions we have model-specific assumptions. These are assumptions that delineate and idealize the issue we want to study. These are typically assumptions about consumers' preferences, firms' costs, the structure of value chain, and the information available to the different agents and how soon the actions of other agents can be observed. These can also be assumptions related to how negotiations are performed. In competition models, assumptions related to the possibility of entry by new firms are important.

In addition to the basic assumption and the model-specific assumptions, assumptions regarding exogenous variables are necessary to determine equilibrium. In competition models, this might typically be the number of firms in the market. There is no waterproof distinction between assumptions and exogenous variables. It can, for instance, be assumed that the cost

associated with establishing a firm in the market is E . This is a model-specific assumption. The size of E becomes an exogenous variable. When we perform a counterfactual analysis of effects and analyze hypothetical scenarios in general, it is the exogenous variables we manipulate. We might, for instance, analyze the effects of a reduction of the number of firms from N_1 to N_2 . It might also be assumed that each firm, i , has a marginal cost of c_i . c_i is then an exogenous variable that can be manipulated.

From the basic assumptions, the model-specific assumptions and the exogenous variables, we can deduct possible equilibriums, or the equilibrium, if it is possible to deduct a single equilibrium. As stressed in the discussion of game theory above, multiple equilibriums might substantially reduce the model's informative value in explaining and predicting an outcome. This is particularly important to take into account when we want to predict a particular outcome, but might not reduce the informative value if we want to use the model to make inferences on possible outcomes. As discussed above, we might, for instance, not be as interested in the particular equilibrium outcome in antitrust analysis as in the possible equilibriums. For instance, if we wonder if some conduct facilitates coordination among competitors, we are more interested in whether conduct makes coordination a more likely outcome rather than the particular coordinated outcome. The equilibrium is, together with the basic assumptions and model-specific assumptions, the basis for the welfare analysis. The model-specific assumptions are important for the welfare analysis because the assumptions concerning, *inter alia*, costs and utility, influence welfare. By manipulating the exogenous variables, we can analyze the effects on welfare. We can find out how a counterfactual value of an exogenous variable affects equilibrium and welfare. In a model, we can, for instance, analyze whether a merger causes a reduction in total surplus or consumer surplus by comparing a model where the two firms not merge by a model where the two firms merge. If the total welfare and/or the consumer welfare decreases under the model where the two firms are merged compared to when they do not merge, we can infer that within the model framework that the merger will reduce welfare and/or consumer welfare.

From an Occam's razor perspective, economic models that explain or predict the data that are based on fewer assumptions should be preferred to models based on more assumptions. However, all the implicit assumptions in economic models make a "counting" of assumptions difficult, and in many situations, almost meaningless. The simple monopoly model illustrates this problem. This model is simple in the sense that the monopolist is assumed to set one profit maximizing price in the market. However, by taking all implicit

assumptions into account, the simple monopoly model is not so simple anymore. It is assumed that the monopolist is not subject to potential competition, with the result that strategic behavior is not complicating the model. It is also assumed that the monopolist is not able to price discriminate. This also includes the assumption that the monopolist will not reduce the price after he has sold to those who are willing to pay the high price. Other models have shown that altering this assumption changes the prediction of the monopoly outcome dramatically.⁷³⁷ Thus, decision makers should be careful in applying Occam's razor qualitatively as a method to assess the informative value of a model. One can easily be misled by all the implicit assumptions that underpin an apparently simple model.

Robustness is about the sensitivity of the assumptions on the inferences made from the model as described above. The informative power of an economic model might be sensitive to both the basic assumptions and the model-specific assumptions, including assumptions concerning the variables that are assumed exogenous. Assumptions on exogeneity might be determining for the model prediction. There are different ways to cope with assumptions. One way is to compare the assumptions with corresponding aspects of the actual situation we are modeling. If an assumption is in line with reality, the assumption is justified. However, it is not always so easy to check the assumptions' compliance with reality because of observation problems. For instance, it is relatively difficult to check that the rationality assumptions are satisfied. In this case, we can check the models' sensitivity to the assumptions. If the prediction of the model is not very sensitive to the assumption, real world evidence on presence of the assumption is not so crucial. This can be illustrated by the perfect competitive equilibrium model. If there is strong competition, inefficient firms who do not adapt rationally will be eliminated by the competition from competitors who behave like they are rational. This follows from models of evolutionary game theory, as described above. If the equilibriums based on the assumption of rational players are also equilibriums based on evolution-inspired assumptions, the models are robust for the rationality assumptions. Note that if the purpose of the modeling effort is instrumentalism, the compliance with the assumptions is not crucial as long as the model is informative in predictions.

A critique against neoclassical economic models, especially addressed by the Austrian school, is the use of equilibriums for comparative analysis, as discussed above. It can be

⁷³⁷ See Coase (1972). The monopolist has an incentive to reduce the price when all with high willingness to pay has purchased the good. The customers know this, and will wait until the price is reduced. A durable goods monopolist who cannot credibly commit to not reduce prices in the future will then be forced to price at marginal costs from the start. However, if the customers are impatient, the producer may exploit this impatience to charge higher prices in the start. See von der Fehr and Kuhn (1995).

considered as an assumption as such that equilibrium outcomes can be used to assess the effects of conduct. This assumption might be robust or not robust, depending on the circumstances. If we believe that the economy most of the time is out of equilibrium, what informative value is there to compare equilibriums to assess effects? Given that we, most of the time, are out of equilibrium the process towards equilibrium becomes more important. This means that we should not only assess what effect some action has on equilibrium outcome, but the effect on the process towards equilibrium as such. If we, for instance, believe that competition facilitates a more efficient process towards an unknown long-run equilibrium, this should be taken into account as such. This is central to antitrust analysis as its purpose is as much about protecting the competitive process as protecting the competitive equilibrium.

This section compromised a qualitative assessment of the informative value of economic models used in antitrust analysis. The next section will discuss how econometrics and statistics can be used to more precisely quantitatively assess the informative value of models.

6.3.3 Quantitative assessment of the informative value of models

The quantitative assessment of the informative value of economic models requires the use of statistical and econometrical methods. It will be beyond the scope of this study to provide a general survey and review of statistical and econometric methods. The discussion will be kept to how quantitative methods can be used, and are used, to assess the informative value of quantitative model based inferences, with emphasis on econometric models applied in antitrust analysis. It will be relied upon on the general statistics and econometric literature, as well as specialized literature on the use of statistical and econometrical methods in litigation in general⁷³⁸ and antitrust in particular.⁷³⁹

Testing model assumptions

An element of the quantitative assessment of models is testing the assumptions and the sensitiveness of the assumptions crucial for the validity for the inferences made. Such assumptions include everything from technical statistical properties of the residuals⁷⁴⁰ to crucial structural properties of the models. Such crucial structural properties of the model

⁷³⁸ Seminal contributions on statistics in the courtroom include Kaye (1986) and Kaye (2001). See also Kaye and Freedman (2000). A seminal contribution on econometrics in the courtroom is Rubinfeld (1985). See also Rubinfeld (2000).

⁷³⁹ See, for instance, ABA (2005). A recent textbook treatment is Garcés and Davis (2009)

⁷⁴⁰ Such as if the residuals follow a normal distribution.

include checking the exogeneity assumptions and causality assumptions made in the model. The exogeneity assumption includes that there are no dependencies between the explanatory variables of the model and the unexplained factors captured by the residuals. Tests for exogeneity include checking correlation between the explanatory variables and residuals, and visual methods, such as residual plots. Lack of exogeneity is likely to yield biased estimators, with the result that the estimates are not likely to yield the true dependency between the explanatory variable and the variable to be explained or predicted.⁷⁴¹

Establishing exogeneity is a crucial element in establishing a causal link. However, identifying causal connection requires far more than testing for independence between explanatory variables and residuals. We still do not know the direction of an eventual causality, or if the dependency is due to a correlation with another explanatory variable in the model. There is a substantial body literature on checking causality assumptions and identifying causal connections.⁷⁴² However, it will be beyond the scope of this study to provide a detailed study of quantitative techniques in identifying causality.

Testing basic model assumption provides information as to whether we are likely to obtain reliable estimators and estimates which are important for the informative merits of the model. However, testing the model assumptions gives scarce information on the relative informative power of competing models complying with the basic assumptions. Thus, more advanced tools are necessary to test the relative merits of competing models. Rather, the validity of the assumptions can be seen as a prerequisite for the reliability of the inferences made from the models.

Testing significance of model parameters and other methods of parameter inference

After validating assumptions, a question remains as to whether the identified dependencies in the model can be concluded with sufficient confidence. If we are not sufficiently confident that there is an explanatory link between a variable and the response variable, it might be better to exclude it from the model according to the principle of parsimony.

By using the laws of probability, one can derive approximate probability distributions for the estimators and other combinations data that includes the true parameter. This means that it is possible to calculate probabilities of the outcome of estimates and other test statistics under the assumption that the parameters have specific values and that the model as such is

⁷⁴¹ See, for instance, Rubinfeld (1985), Kaye (1986), Davis and Garcés (2009) p. 65 and Wasserman (2003) p. 209 f.

⁷⁴² See, for instance, Davis and Garcés (2009) p. 89 f. See also Wasserman (2003) p. 251 f.

“true”.⁷⁴³ Assuming that the model as such is true means that it is assumed that the other assumptions associated with the model are valid.⁷⁴⁴ Below, the informative value of the statistical tests will first be briefly addressed assuming the validity of model assumptions. After this, the problems associated with the invalidity of model assumptions below will be returned to.

A way to assess the confidence in the dependency between the explanatory variable and the dependent variable is testing statistical significance by hypothesis-testing. This is one of the most common methods used to make inferences about parameters in legal evidence.⁷⁴⁵ A usual test is to test a null hypothesis that a parameter is zero, against the alternative hypothesis that a parameter is different from zero.⁷⁴⁶ However, other hypotheses can be tested, such as for example that a parameter is “5”, or any other value, or that two parameters are equal.

The question in hypothesis testing is whether we can reject the null hypothesis with significance level α . If we can reject the hypothesis, this is often referred to as the parameter being statistically significant⁷⁴⁷ different from zero, with a significance level α (assuming the null hypothesis is that the parameter is zero). We reject the null hypothesis with significance level α if there is less than α percent likely to observe the test-data or more improbable test data given that the null hypothesis is true.⁷⁴⁸ For instance, if we operate with a five percent significance level, a rejection means that there is less than five percent chance of observing the test-data or more improbable test data given that the null hypothesis is true. Since there is less than five percent chance of observing the test-data, or a more improbable test data, when assuming that the null hypothesis is true we reject the hypothesis.⁷⁴⁹

If we are not able to reject the null hypothesis, this only means that we cannot infer that the parameter is significantly different from zero with significance level α . It might still be much more likely to get the observed data given that the parameter is different from zero

⁷⁴³ True in the sense that the model truly describes the process that generated the data. See for instance Rubinfeld (1985).

⁷⁴⁴ See Kaye (2001).

⁷⁴⁵ See Kaye (1986), Kaye (2001) and Greenland and Poole (2011).

⁷⁴⁶ If we for instance want to make inference about a parameter β_1 , the null hypothesis is $H_0: \beta_1 = 0$ and the alternative hypothesis $H_1: \beta_1 \neq 0$. This is a two-sided test. One can also operate with one sided tests which means that for instance test the null hypothesis is $H_0: \beta_1 = 0$ against the alternative hypothesis $H_1: \beta_1 > 0$. Here we will operate with two-sided tests.

⁷⁴⁷ Statistical significance is different from numerical significance. The possibility of confusing these measures, and the possibility of exploiting this confusion in abuse of rhetoric, is returned to below.

⁷⁴⁸ See Sober (2008) p. 54 and Kaye (1986).

⁷⁴⁹ This can be illustrated with an example. Assume that we flip a coin. Our hypothesis is that the coin is fair which means that the probability of head p is 0.5. We flip the coin 20 times and obtain 17 heads. The question is then if getting 17 heads or more is so improbable given that $p = 0.5$ that we reject the hypothesis that p is 0.5.

than if the parameter is zero. In other words, the alternative hypothesis might still be more likely than the null hypothesis, even if we cannot reject the null hypothesis with significance level α . This reveals a fundamental philosophical problem of using significance tests for inference. Even if we cannot reject the hypothesis that the parameter is zero, the hypothesis that the parameter is, for instance, “5”, or some other value different from zero, might be much more likely.⁷⁵⁰ This is of crucial importance when statistical inference is used in as legal evidence. While being able to reject a hypothesis might have high inferential value in refuting a non-dependency, not being able to reject is by no means a proof of non-dependency. A dependency might still be up to infinitely more likely than non-dependency. If we, for instance, instead tested whether the parameter is “5”, we might not be able to reject this hypothesis either. This illustrates the importance assessing a hypothesis against a proper alternative hypothesis.⁷⁵¹ Let us say that we cannot reject the hypothesis that a parameter is zero with significance level α . The data might still be 100 times more consistent with the parameter being, for instance, “5” than being zero. One way to address this problem is to test the likelihood ratio between the hypotheses rather than just testing the parameter. In this way, one could, for instance, test if the likelihood ratio⁷⁵² between that the hypothesis that the parameter is zero and the hypothesis that the parameter is, for instance, “5” is significantly greater than one.⁷⁵³

Another fundamental problem is the choice of significance level α . According to the theory of rational decisions, the consequences in terms of expected error costs should determine the optimal choice of making type-1 errors. This means that, from a decision theoretic point of view, the usual choice of significance level of five or ten percent might be arbitrarily, and not in line with a rational decision taking the relative costs of type-1 errors and type-2 errors of the particular case into account.⁷⁵⁴ Kaye (2001) traces the convention of using five percent test-levels back to the British statistician, Sir R.A Fisher, who was one of the founders of modern frequentistic statistics. Posner (1999b) points out that using the five or ten percent level of significance level for testing is a convention that origins from screening due

⁷⁵⁰ See Sober (2008) p. 54 f. Assume that we flip a coin. Our hypothesis is the coin is biased and that the probability of head p is 0.4. We flip the coin 20 times and get 11 heads. Even if we cannot reject the hypothesis that $p=0.4$ with these observations, it is relatively more probable to obtain the data if $p=0.5$.

⁷⁵¹ See Kaye (2001) for a discussion. See also the European Commission Best practices on the submission of economic evidence, op. cit., paragraph 18.

⁷⁵² As described above the likelihood-function is the likelihood of data given model and parameter assumptions. The likelihood ratio is then the ratio between the likelihood functions under different assumptions on the parameters.

⁷⁵³ See, for instance, Greenland and Poole (2011).

⁷⁵⁴ See also Rubinfeld (1985) and Kaye (1986) for making the same points.

to scarce space in scientific journals. This issue is returned to in the discussion of Bayesian methods below.

Significance testing continues to be extremely important in statistical inference including the use of statistics and econometrics in antitrust analysis.⁷⁵⁵ Despite the lack of rationality justifications for the significance levels, the conventions for statistical significance levels are crucial in determining whether a parameter is included in the models used for inferences. Significance-testing favors a null hypothesis in the sense that a null hypothesis may not be rejected even where an alternative hypothesis is more probable. This might be exploited by the parties in litigation by trying to formulate a null hypothesis in their favor. This will be explored further in the discussion of actual assessment of economic models in antitrust analysis below.

Significance testing is one of many methods of making inferences about parameters given the validity of the model assumptions. In addition to hypothesis-testing, p-values and confidence intervals often appear in statistical parameter inference. A p-value is simply the probability of obtaining the test data or more improbable test data, given that the null hypothesis is true. A 1-x percent confidence interval of a parameter is an interval which in 1-x percent of the times it is constructed from test-data will cover the true parameter. Thus, if we construct a 95 (x is 5) percent confidence interval, we are 95 percent “confident” that this entails the true parameter.⁷⁵⁶ The wider a confidence interval is, the less certain is the estimate. If zero is in the confidence interval, this means that we cannot reject with 95 percent confidence that there is no dependency. The p-value, hypothesis-testing and confidence intervals are all related. Assume that the p-value is p. If p is less than x then the null-hypothesis will be rejected on an x percent significance level. If the null-hypothesis is that a parameter is equal to zero, and this hypothesis is rejected at significance level x, this means that the 1-x percent confidence interval for the parameter does not entail zero.

Both p-values and confidence intervals provide more information than a significance test. With a significance test, we only know if the parameter is significant at the specified significance level, while the p-value provides information on exactly how probable it is to get the observations and more extreme observations. Thus, it has been suggested that p-values should be reported in litigation rather than just the result of a significance test.⁷⁵⁷ Confidence

⁷⁵⁵ See for instance Davis and Garcés (2009) and ABA (2005).

⁷⁵⁶ Note however that this does not mean that the probability that the parameter is in this interval is 1-x. For this misconception and other misconceptions associated with the use of statistics in litigation, see Greenland and Poole (2011).

⁷⁵⁷ See Kaye (1986) and Greenland and Poole (2011).

intervals also provide more information than just a test of significance because we can make an assessment of where our estimate is situated within the confidence interval. Still, the complex statistical theory that underpins confidence intervals and the risk for non-trained decision makers to misunderstand the concept may reduce its value in litigation contexts. Thus, p-values are probably more suitable for litigation.⁷⁵⁸

As mentioned above, it should be noted that, in addition to the assumption regarding the parameter tested, the assumptions associated with the model itself are also assumed to be valid in the testing of significance and the derivation of p-values and confidence intervals.⁷⁵⁹ This is an additional source of uncertainty. This means that inferences made on the parameters may not be valid if the model assumptions are not valid. Failing to find a parameter significant may happen because the parameter is not significant or because the model assumptions are wrong. Thus, testing parameters have limited value if not the assumptions, or at least the sensitiveness of the assumptions, are tested, as described above. Furthermore, finding a parameter significant does not mean that the model is good. By the parametric inference described above, we are not testing the model as such. We are testing properties of the parameters, given the model. If the model as such is bad, an issue we will get back to just below, the inference value of finding a parameter significantly different from zero might be low.

Assessing the models' informative value

Testing the validity of assumptions and making inferences on parameters has limited value in assessing the informative value of models. Testing model assumptions is a prerequisite for the validity of inferences. Standard parametric inferences give information on the parameters, given the validity of assumptions. In addition to testing the assumptions of a model and the significance of its parameters, statistical inference can also be employed to test the goodness of models as such. These tests more directly address the probability of a model, $p(M_i)$, that was discussed in the beginning of this subchapter. The most probable model is presumably the one that explains or predicts data best dependent on the purpose of modeling.

A basic test statistics used to test the goodness of a model is R^2 (R-squared) and R^2_{adj} (adjusted R-squared). R^2 and R^2_{adj} are basic measures that often appear when regression is

⁷⁵⁸ See Greenland and Poole (2011) for a discussion of possible misconceptions associated with confidence intervals.

⁷⁵⁹ See for instance Rubinfeld (1985) and Greenland and Poole (2011).

used in litigation.⁷⁶⁰ R^2 is a measure of how well the variation in data can be explained by the model. Before R^2 is described more precisely, some other statistics are necessary to aid the understanding. SS_{tot} is the total variation in the response variable, y .⁷⁶¹ SS_{err} is a measure on how much the model errs in explaining the variation in y . In mathematical terms, these measures are:

$$SS_{tot} = \sum (y_i - \text{average}(y))^2,$$

$$SS_{err} = \sum (y_i - y_i^{\wedge})^2.$$

y_i^{\wedge} is the value of y that is predicted by the model using the explanatory variables corresponding to y_i . R -squared is defined as $R^2 = 1 - SS_{err}/SS_{tot}$. The better the model explains the variation in data, the less is SS_{err} . By dividing SS_{err} by SS_{tot} , we get the model error as a share of the variation in the data. SS_{err}/SS_{tot} is always between zero and one. If the model perfectly explains the variation in the data meaning that $SS_{err} = 0$, then R^2 reaches its maximum value of one. The poorer the model is in explaining the data, the closer SS_{err} will be to SS_{tot} , and the closer R^2 is to zero.

A problem associated with R^2 is that it can reward coincidences in the data as explanatory power. The more explanatory variables we have, the more likely it is that a model appears to have high explanatory power due to coincidences. If we have as many independent explanatory variables as observations, the model might appear to have perfect explanatory power. Assume that we roll a die every day of a week. Monday we get two eyes, Tuesday four eyes, and so on. If we use day as an explanatory variable, meaning that $x_1 = 1$ if it is Monday (and 0 else) until $x_7 = 1$ if it is Sunday (and 0 else), then day will appear to perfectly explain and predict what number of eyes shows up on what day. Thus, using day as a model to predict the number of eyes will appear to perfectly explain the number of eyes that will appear on the die. R^2 will be one. Still, it is obvious this model would not do very well in predicting the outcome of a similar exercise the week after. Thus, parsimony in variables should be rewarded, as explained above. R^2_{adj} (adjusted R -squared) rewards parsimony in variables by punishing a high number of explanatory variables relative to observations. Mathematically, R^2_{adj} is

⁷⁶⁰ See Kaye (2001). R^2 appeared for instance in the EU Ryanair/Aer Lingus Case No COMP/M.4439 – Ryanair / Aer Lingus [2007] upheld by the court in Cases T-342/07 and T-411/07 Ryanair Holdings plc and Aer Lingus Group plc v Commission [2010]. See de la Mano et al. (2007).

⁷⁶¹ The variable to be explained or predicted.

$$R^2_{adj}=1-[SS_{err}/(n-k-1)]/[SS_{tot}/(n-1)]=1-(1-R^2)[(n-1)/(n-k-1)].$$

n is the number of observations and k is the number of explanatory variables.⁷⁶² We can see that, all else being equal, R^2_{adj} is bigger the less k is relative to n . A model with fewer explanatory variables is rewarded, and a simple model with lower R^2 might give a higher R^2_{adj} than a more complicated model with higher R^2 . It should be mentioned that R^2_{adj} does not have the exact same intuitive explanation as R^2 , and R^2_{adj} is not always better than R^2 as a statistics to assess models.⁷⁶³ As n becomes sufficiently large relative to k , R^2 and R^2_{adj} coincide.

A problem with tests like R^2_{adj} and other tests that are based on testing whether predicted values \hat{y}_i are close to the observed y_i is the bias following from testing the goodness of the model on the same data that are used for the estimation. $SS_{err}=\sum(y_i-\hat{y}_i)^2$ is influenced by the fact that the estimated parameters that are used to calculate \hat{y}_i , are estimated with the basis in the y_i 's and their associated explanatory variables. Ideally, the models should be used to predict some other data than the ones used in the estimation. Using days to predict the outcome of a die in the example above is an extreme example. The predictions would appear perfect if they are used on the same data used for the estimation, but the calibrated model would perform quite poorly if it were used to predict other data than those used in estimation (it would, on average, predict correctly 1/6 of the times). This is an extreme example since the number of explanatory variables was the same number of observations, but the principle also applies in other situations. Ideally, separate data should be used for estimation and for testing the goodness of the model. This means that some observations should be used to estimate the parameters a, a_1, \dots, a_k , and then some other observations should be used to test the predictive power of the model. For instance, if we have n observations, half of the observations (by drawing randomly $n/2$ of the observations) could be used to estimate the parameters, and the other half could be used to test the fit of the model, for instance, by calculating $SS_{err}=\sum(y_i-\hat{y}_i)^2$. There are developed several statistical tests for testing the explanatory and predictive power of the model on other data than those used for estimation.⁷⁶⁴

⁷⁶² $SS_{err}/(n-k-1)$ and $SS_{tot}/(n-1)$ are unbiased estimators for the variance of the errors and observations, respectively.

⁷⁶³ R^2_{adj} is better than R^2 when the test is for a representative sample of the population and not the whole population.

⁷⁶⁴ This is known as cross validation. See Wassermann (2003) p. 218 f.

R^2 and R^2_{adj} are simple statistics used to assess the goodness of the models. These statistics appears in all standard statistical packages. The merits of two competing models can to some limited extent be compared by using R^2_{adj} . However, this is not considered as a suitable method to formally test the relative merits of models.⁷⁶⁵ There are more powerful statistical tools to test the relative merits of models. It will be beyond the scope of this study to give a survey of such methods. However, it should be mentioned that there are developed methods that can be used to directly calculate model probability $p(M_i)$. These methods employ information theory. AIC is short for “an information criterion” and can be used to calculate model probabilities.⁷⁶⁶ AIC is a measure that should be as low as possible and awards a model’s consistency with data and parsimony in variables.⁷⁶⁷ We can calculate

⁷⁶⁵ See for instance Gujerati (1995) p. 207 f.

⁷⁶⁶ Anderson (2008) p. 56.

⁷⁶⁷ Assume that f is the “reality”, or, more precisely, the information in knowing reality. The more uncertainty in what the reality is, the more information is gained from learning the reality. Assume that g is a model with parameters θ . The information value of a model can be seen as the distance between the information in the model and the information in knowing reality. If f is the reality and g is the model, this distance can be written as $I(f,g)$. This is the Kulbach-Leibler (K-L) information of g , see Anderson (2008) p. 53. $I(f,g)$ is the information lost by relating to the model instead of reality. We want this distance to be as little as possible. Let $S(R)$ be the uncertainty about the reality. This can be written as

$$S(R) = - \int f(x) \log f(x) dx.$$

This uncertainty is the so-called entropy of reality, R . Assume that the world may have two possible outcomes with probabilities p_1 and $p_2 = (1 - p_1)$. The entropy is then $E = S(R) = -[p_1 \log p_1 + (1 - p_1) \log (1 - p_1)]$. The reality might, for instance, be the outcome of tossing a coin. The more uncertain the outcome is, the more information there is in observing the actual outcome (the reality). Assume that the coin is fixed making the probability of heads 99 percent. If we know this, we are quite certain that the outcome will be heads, so it is not so much information of observing the actual outcome. With a fair coin where the probability of heads is 50 percent, there will be maximal uncertainty. The function E above will be maximized when there is maximal uncertainty. This means that it is maximized when $p_1 = 1/2$. For more theory on entropy, see MacKay (2003) p 22 f. and Anderson (2008) p. 54. Let $S(R|g)$ be the uncertainty about the reality when we know the model. This is,

$$S(R|g) = - \int f(x) \log [g(x|\theta)] dx,$$

where x are the possible outcomes of reality. We want $S(R) - S(R|g)$ as large as possible because we want g to reduce uncertainty as much as possible. This is the same as wanting $-[S(R) - S(R|g)]$ as small as possible. The less we know about reality *ex ante*, the less is required for a model to have information value. For a model to have value, it must reduce uncertainty. Thus, the right question as to whether a model is good or not is not whether it gives a good description of reality, but how much it reduces the uncertainty of reality. This highlights the instrumental value of models. If our goal is to predict something it does not matter if the model is a good description of reality as long as it performs well in the prediction. $I(f,g)$ can be written as

$$I(f,g) = -[S(R) - S(R|g)] = - \int f(x) \log f(x) dx - \int f(x) \log [g(x|\theta)] dx = C - E(\log [g(x|\theta)]),$$

where C is a constant not depending on θ that we can ignore. Since we want $I(f,g)$ as small as possible, this is the same as wanting $-E(\log [g(x|\theta)])$ as small as possible. We cannot calculate the true $-E(\log [g(x|\theta)])$, since this would require us to know the true parameters θ . However, an estimator for the expected $-E(\log [g(x|\theta)])$ is

$$-EE(\log [g(x|\theta)])^{\wedge} = -I_g(\theta^{\wedge}_g) + K,$$

AIC_i , which is the AIC of model i . Thus, the lower the AIC, the better is the model. This is not a statistical test in the meaning that we can derive statistical properties, though. This measure works well if the number of observations is much larger than the number of parameters. If this is not the case, it has been shown in statistical theory that AIC should be adjusted for possible bias.⁷⁶⁸ The adjusted AIC can be written as

$$AICC_i = AIC_i + 2k(k+1)/(n-k-1),$$

where n is the number of observations and k is the number of parameters. We can see that when n increases relative to k , $AICC_i$ approaches AIC_i . Assume that z is the available model with the lowest AICC, with value $AICC_z$. The distance between this model and some other model, i , is

$$\Delta_i = AICC_i - AICC_z$$

Δ_i says something about how good a model is in comparison to the best available model. We can use Δ_i to create weights, w_i , for the different models we have investigated. Such a weight is determined by

$$w_i = \exp(-(1/2)\Delta_i) / \sum_k \exp(-(1/2)\Delta_k) = \exp(-(1/2)AICC_i) / \sum_k \exp(-(1/2)AICC_k).$$

w_i can be interpreted as the probability that model i is the model that has the highest information value of the models investigated.⁷⁶⁹ This means that we can interpret w_i as $w_i = p(M_i | \text{data})$. $p(M_i | \text{data})$ is, in this context, not exactly the probability that a model is true, but the probability that model i is the model with the highest information value among the investigated models. This can be used as a substitute for $p(M_i)$. This probability is highest for

where $l_g(\theta^{\wedge}_g)$ is the maximum log likelihood value for model g . This means that the maximum likelihood estimates are inserted in the log likelihood function. K is the number of parameters to be estimated. Thus, we want $-l_g(\theta^{\wedge}_g) + K$ as small as possible. A model is awarded for a high maximum log likelihood value, which means consistency with observations, and a low number of parameters (parsimony). The reason is, as explained above in the main text, that a high number of parameters increase the chance for coincidental consistency with data without any informative merits. With high K , there is, in other words, a chance that the model fit well with data, but still does not explain or predict well, such that the information value is low. For historical reasons $AIC_g = -2l_g(\theta^{\wedge}_g) + 2K$ is used as the measure we want as low as possible instead of $-l_g(\theta^{\wedge}_g) + K$, which means that the last is multiplied by 2. Since this is only a positive linear transformation this has no impact on the assessment.

⁷⁶⁸ Anderson (2008) p. 60 f.

⁷⁶⁹ Anderson (2008) p. 88.

the model with the lowest AICC. For this model, $\Delta_i=0$. How much better this model is than the other models is dependent on the distance to the other models. To the author's knowledge, the use of information theory to assess model information has not so far had a major role in the use of statistics in antitrust litigation.

The reason for bringing this rather technical issue into the text is to illustrate that there are methods to quantitatively assess the informative value of a model in terms of probabilities. However, to calculate this probability, one needs certain information for all models. One needs the AIC (or more precisely, AICC) for all models that are employed for model-based inferences. This intuition is crucial in the discussion of the actual assessment of economic models below. The question will then become whether the antitrust procedure generates the information necessary to assess the relative merits of models and if there are anybody who will provide this extra information by assessing the relative merits of all models presented.

Note that, in addition to being interpreted as a probability of which model is best, the w_i 's can be used as weights in so-called multi-model inference. If alternative models give us different estimates or predictions, the estimate or prediction from each model can be weighted by their respective w_i 's.⁷⁷⁰ This can be used both in prediction and in inferences about parameters. Assume, for instance, that we have three different models that give different predictions of the effect on price of some antitrust-relevant conduct. Instead of choosing the prediction of the best model, we can weigh the predictions of each model by their weight w_i , to get a weighted average prediction. When it comes to inference about parameters, we can, in the same way, weigh the estimates of a parameter from different models.

The Bayesian approach

The statistical methods of parameter estimation, parameter testing, and model testing discussed above are so-called frequentistic methods. The inferences on parameters are based on consistency with data. Frequentistic methods have often been contrasted to Bayesian methods of statistical inference.⁷⁷¹ In frequentism, parameters are not considered stochastic. A parameter has some objective true value and is not a random variable. We cannot, for instance, say that the probability that a parameter is positive is 50 percent. We can, however, say something about the probability of data under various assumptions of the parameter and the model itself. This enables us to do significance tests and apply other methods of statistical

⁷⁷⁰ Anderson (2008) p.105 f.

⁷⁷¹ See Wasserman (2003) p. 175, Cox (2006) p. 194, Sober (2008), Chapter 1 and Gilboa (2009) p. 40 f. for discussions.

inference, such as calculating p-values and constructing confidence intervals. These can be used to make inferences about the parameter. The inferences are based on the principle that if the observed data are too unlikely given the assumptions, we reject the assumptions. If, for instance, the observations are very unlikely under an assumption that a parameter is zero, we use this to reject the assumption.⁷⁷²

In Bayesian statistics, we are allowed to talk about the probability of parameters, and we can use Bayesian methods to state the probability that a parameter has a specific value or is within some interval. For this, we need both an a priori distribution of the parameters and a model of the probability of data, given the parameters.⁷⁷³ The a priori probability assessment might be based on previous experiences and previous data collection, or just a hunch. We might also use a so-called non-informative prior limiting the impact of a priori “prejudices” as much as possible. With a non-informative prior, it is typically assumed that any possible value of a parameter θ is equally probable. In this way, the a priori assessment gets as little influence on the a posteriori distribution as possible, which means that the a posteriori probability distribution is mainly determined by data. Parametric inferences from Bayesian and frequentistic methods often converge in these situations.⁷⁷⁴ Observations have the role of updating the a priori assessment. The actual observations are used to rationally correct our a priori beliefs of the probabilities.⁷⁷⁵ Bayesian methods seem to be a nice fit to legal

⁷⁷² We might, for instance, assume that p is the probability of heads when flipping a coin. In frequentism p is not stochastic. Inferences on p are based on consistency of data with p . If we flip the coin 50 times and get 3 heads, this will probably lead us to reject a hypothesis that p is $1/2$ as the observations are very unlikely given that p is $1/2$.

⁷⁷³ Bayesian statistical inference has got its name from its application of Bayes’ rule. Assume that $f(\theta)$ is the a priori probability distribution for the parameter, θ . Furthermore, assume that $f(y_1, \dots, y_n | \theta)$ is a probability density for the data y_1, \dots, y_n , given θ . This coincides with the likelihood function used in frequentism. From these assumptions, and applying Bayes’ rule, we get

$$f(\theta | y_1, \dots, y_n) = [f(y_1, \dots, y_n | \theta) f(\theta)] / f(y_1, \dots, y_n) = [f(y_1, \dots, y_n | \theta) f(\theta)] / \int f(y_1, \dots, y_n | \theta) f(\theta) d\theta.$$

We can use $f(\theta | y_1, \dots, y_n)$ to make updated probabilistic inferences about θ . We might for instance find the probability that θ is greater than θ_a ($\theta > \theta_a$). This is

$$P(\theta > \theta_a) = \int_{\theta > \theta_a} f(\theta | y_1, \dots, y_n) d\theta.$$

⁷⁷⁴ Wasserman (2003) p. 181 f.

⁷⁷⁵ In Bayesianism, we can, for example, allow the probability p of heads when flipping a coin to be a stochastic variable. Our a priori belief, might, for instance, be that p is 0.8 with 80 percent probability and 0.2 with 20 percent probability. When we flip the coin many times, we get observations that we can use to modify a prior the probability distribution using Bayes’ rule. Assume that we flip the coin 50 times and get 45 heads. These observations would update our beliefs and increase the probability that p is 0.8 as the data is more consistent with p being 0.8 than p being 0.2. We can reduce the impact of the a priori belief by so-called non-informative priors. Our a priori assessment of p might for instance be that p is uniformly distributed between 0 and 1.

assessments.⁷⁷⁶ In fact, this was the approach in Chapter Five of this study. Prior knowledge and legal presumptions can be interpreted as the basis for an a priori probability that can be updated by evidence (observations).

In Bayesian statistics, decision theory can be used to derive estimators and estimates. This means that we find estimators that minimize expected loss in line with the decision theory discussed in previous chapters of this study.⁷⁷⁷ A loss function is used to assess the consequences of having wrong estimates, and the estimators are determined so that the expected loss is minimized.⁷⁷⁸ This means that, if the consequences of having wrong estimates on one side are worse than the consequences of a wrong estimate on the other side, then this will influence the estimators.

Despite frequentism being the mainstream approach in statistical analysis, the Bayesian approach has many advocates, especially among philosophers of science.⁷⁷⁹ The Bayesian approach is more in line with the principles of rational decision theory. The statistical analysis can be tailored to the decision problem it is supposed to be used for. The estimate can be rationally optimized to the error losses in the specific situation. The choice of significance levels in frequentistic tests may be poorly suited for the specific decision problem in question, as described above. A decision where a parameter is assumed zero, because it is not found to be significantly different from zero, might be a bad decision according to the rationality standard. More generally, the choice of hypotheses to test in frequentistic methods might not be in line with rational decisions. When Bayesian methods are used, these imperfections do not constitute the same problem, as we can speak of the probability of parameters directly. One major criticism of Bayesianism is its dependency on subjective priors. The subjective element of the Bayesian approach can be minimized by using non-informative priors, as mentioned above. Another way to get around the prior is to adhere to likelihoodism. In likelihoodism, all inferences are based on the likelihood ratio

⁷⁷⁶ Bayesian methods seem to be endorsed by many influential contributions on the use of statistical methods in litigation. See Rubinfeld (1985) and to some extent Kaye (1986). A recent textbook treatise is Taroni et al. (2010).

⁷⁷⁷ See Wasserman (2003) p. 193 f.

⁷⁷⁸ A loss function $L(\theta^{\wedge}, \theta)$ is the loss of using θ^{\wedge} as estimate when the true parameter is θ . The expected loss using the a posteriori probability distribution for θ is:

$$EL(\theta^{\wedge}, \theta) = \int_{\theta} L(\theta^{\wedge}, \theta) f(\theta | y_1, \dots, y_n) d\theta.$$

The loss of using an estimate is dependent on the specific decision the estimate intended to be used. For instance, there could be a much greater loss associated with a too high estimate than a too low estimate. There are some "standard" loss functions. Such a loss function is the quadratic loss function, meaning that $L(\theta^{\wedge}, \theta) = (\theta^{\wedge} - \theta)^2$. With this loss function, we have $E(\theta^{\wedge} | y_1, \dots, y_n) = \theta$. See Wasserman (2003) p. 198.

⁷⁷⁹ See Sober (2008), Chapter 1.

between hypotheses. Likelihood ratios were explained in the context of evidence assessment earlier in this study, and were briefly discussed in the context of hypothesis testing above.⁷⁸⁰ Basing the inferences on likelihood ratios means that all inferences are based on the relative merits of competing hypotheses. This means that all inferences are relative.⁷⁸¹

Another advantage of Bayesian methods is the possibility to directly assess model probabilities. Assuming some a priori probability assessment of a model, we can derive the a posteriori probability of a model. Assume that D is the actual observations. We can calculate the likelihood of the data given the model $p(D|M)$. By using Bayes' rule, we have that

$$p(M|D) = p(D|M)p(M)/p(D)$$

The probability ratio between model i and j , is then given by

$$p(M_i|D)/p(M_j|D) = p(D|M_i)p(M_i)/p(D|M_j)p(M_j)$$

Calculating the probability ratio eliminates the need for calculating the unconditional probability of data, $p(D)$. Still, the Bayesian methods do not fully solve the problem of calculating probabilities for models as we still need the a priori probabilities for the models. However, the a posteriori probabilities can be approximated directly by the use of the Bayesian Information Criterion (BIC).

BIC is the Bayesian version of AIC.⁷⁸² The BIC_i can be calculated for a model i .⁷⁸³ In terms of calculation, BIC is not very different from AIC and AICC. The correction for the number of parameters is different, though, and will punish more parameters harder than AIC and AICC. The distance between a model, i , and the best model, z , becomes

$$\Delta_i = BIC_i - BIC_z.$$

⁷⁸⁰ See also Sober (2008) p. 8 f.

⁷⁸¹ Using the coin example again is to assume that we have two hypotheses: either that the probability of heads p equals 0.5 or that it equals 0.8. Likelihoodism would then be to only make inferences on the relative merits of these two hypotheses.

⁷⁸² See Anderson (2008) p. 160 f. and Wasserman (2003) p. 220 f.

⁷⁸³ The BIC for model i is $BIC_i = -2l_i(\theta^{\wedge}_i) + k\log(n)$. $l_i(\theta^{\wedge}_i)$ is the maximum log likelihood function, k is the number of parameters and n is the number of observations.

Δ_i says something about how good a model is compared to the best model, which is the one with the lowest BIC. Δ_i can be used to calculate weights for the various models. The weight of model i is

$$w_i = \exp(-(1/2)\text{BIC}_i) / \sum_k \exp(-(1/2)\text{BIC}_k),$$

where w_i is an approximation to the a posteriori probability of a model i . This can be used in the calculation of $p(M_i)$ which is the probability that a model is true. Thus, it can be applied to give a model weight in making a rational decision based on models. Furthermore, as with AIC and AICC, the w_i 's can be used as weights in multi-model inference.

Some comments on data issues

Above quantitative methods for assessing the informative value of models were discussed. When data is used to assess the informative value of models the quality of data is as important as the methods applied. Inferences based on poor data are likely to be poor even if the best methods are employed. Some failures associated with the data are partially discovered by the methods described above. Statistical methods will reveal whether the data do not correspond with the assumptions made. Furthermore, if, for instance, there is an insufficient amount of data, the estimates will become more uncertain, which will be reflected in the significance-testing. However, this insufficiency of data may make it less likely that the null hypothesis will be rejected. Thus, for someone interested in the null hypothesis to not be rejected this lack of data might be "beneficial".

The data should be representative. Statistical methods might not reveal that data are not representative if there is no check of the informative value of the model on representative data. Even subtle issues may affect the representativeness of data. Assume that to you want find out what the customers consider to be the nearest alternative to some grocery store under antitrust scrutiny. A data collector stands outside the shop and ask the customers what shop they alternatively would have gone to if this shop was not available. Firstly, the answer may depend on the alternative location the responders put themselves into. If they assume that they came to the shop and found it closed, they would choose another alternative than if they made the decision at home. This can, however, be corrected for in the questioning. Furthermore, assume that the data is collected outside the shop on Monday between 1200 and 1300. The average customer arriving the shop at this time might have very different relative preferences for prices and distance to home than the customers arriving, let us say, between 1800 and

1900. For those arriving between 1200 and 1300, the best alternative might, on average, be a discount grocery store further away than a closer non-discount grocery store. For the customers arriving between 1800 and 1900, it might be opposite. This non-representativeness can be utilized to bias the outcome of the statistical analysis even when the best methodology is applied in analyzing the data.

An issue related to the representativeness of data is the issue of outliers and abnormalities in the data. An outlier is a typical extreme observation in data far beyond the general trend. For instance, if we observe the price development for a product over a long time period, we might find that the price increase on average is five percent a year. However, the observation in one particular month may be far beyond that trend. We might, for instance, observe that the price is \$100 in one month, and then \$250 the month after, and then being back at a “normal” level at \$101 the month after that. An outlier may have many explanations. It might be a mistake in the registration of the data. It might also be that the outlier is due to some abnormal situation, for instance, a temporarily shortage due to a crisis situation or weather conditions. The question is what to do with such outliers. If the outlier is due to a mistake in registration, it should definitely be taken out. If an outlier can be traced to some particular but repeating event, a dummy variable for the occurrence of the event might be a solution. If the outliers are not properly taken into account and have a big impact on the estimates of the parameters, one can say that the model is not robust as one or a few observation might have excessive influence on the estimates.⁷⁸⁴ Outliers might also be used strategically to manipulate the parameter estimation. The effect of this can be exaggerated by data selection. This has happened in actual antitrust cases.⁷⁸⁵ This will be discussed further below.

6.4 Actual assessment of economic models in antitrust analysis

6.4.1 Actual evidence assessment and economic models

Inquisitorial versus adversarial procedure

Chapters Two and Five offered a description of the antitrust procedure and how antitrust evidence is actually assessed. It was found that the enforcement of EU competition law is mainly public and that the enforcement of the European Commission best can be characterized as inquisitorial. However, the system is not purely inquisitorial. The parties

⁷⁸⁴ Advanced methods can be used to test the sensitivity of inferences to single observations and to derive estimators that are robust to outliers. See for instance Kaye (2001) and Kaye and Freedman (2000).

⁷⁸⁵ *Conwood Co. v. United States Tobacco Co.*, 290 F. 3d 768 (6th. Cir 2002). See Hovenkamp (2005b) p. 81 f.

have contradictory rights and the decisions are subject to judicial review, though subject to some limits that are particularly relevant for the present chapter, namely in the review of complex economic evidence. Furthermore, it was explained that to address some of the critique against the inquisitorial nature of the EU enforcement, additional steps have been taken to improve the procedure. Most relevant for this chapter is the improvement of the economic expertise of the European Commission by the establishment of a Chief Economist supported by a team of PhD-level economists to increase the quality of the economic analyses. Furthermore, the European Commission has issued best practices on the submission economic evidence.⁷⁸⁶

The enforcement of the antitrust rules in the US is mainly adversarial, and most of the enforcement is private. Thus, it is the parties that have the role of providing evidence, including providing economic expert witnesses that provide expert testimony. However, the role of the judges is not completely passive. The judge has the power to declare evidence inadmissible *inter alia* on the grounds of relevance⁷⁸⁷ and waste of time⁷⁸⁸. Thus, the judge has a role as a gatekeeper. Especially relevant for the assessment of economic models in antitrust analysis is the power of the judges to declare economic expert evidence inadmissible according to the Daubert standard, as described above.⁷⁸⁹ The judges also have the possibility to appoint neutral experts to assist the decision making.⁷⁹⁰

Abductive reasoning

It was concluded in the Chapter Five that antitrust decision makers are not likely to formally use probability theory and expected loss minimization in their overall assessment of evidence. The formal use of probability theory might, however, appear in elements of the evidence assessment, such as when statistical and econometric evidence is evaluated. When experts present econometric evidence, probabilities occur, *inter alia*, when significance levels are applied to make inferences about model parameters. This expert evidence is an input to the overall assessment of evidence.

It was further found in Chapter Five that the overall assessment of antitrust evidence can best be described as abductive reasoning, where the one that assesses evidence searches

⁷⁸⁶ DG Competition, Best practices for the submission of economic evidence and data collection in cases concerning the application of articles 101 and 102 TFEU and in merger cases, Staff working paper, http://ec.europa.eu/competition/antitrust/legislation/best_practices_submission_en.pdf.

⁷⁸⁷ Federal Rules of Evidence (FRE) Rule 402.

⁷⁸⁸ FRE 403.

⁷⁸⁹ FRE 702.

⁷⁹⁰ Federal Rules of Civil Procedure, Rule 26a.

for plausible explanations of the evidence to find a best explanation. Abductive reasoning includes the use of informal methods such as presumptions, analogical reasoning, and appeal to expert knowledge. All these elements are crucial to actual evidence assessment in both the US and EU. Presumptions are an important instrument in antitrust evidence assessment. Antitrust decision makers regularly use analogies by referring to evidence assessments in previous decisions. Expert knowledge, in particular economic expert knowledge, has a crucial role in informing antitrust decisions. This means that inferences based on models argued by experts are crucial in informing antitrust decisions as an element of abductive reasoning.

Literature suggests that abductive inference as a starting point yields a correct evidence assessment.⁷⁹¹ Even if abductive reasoning as a starting point gives the correct evidence assessment, the presence of imperfections and biases may distort the evidence assessment from being correct. There are several sources of imperfections and biases that are likely to distort antitrust evidence assessment. The decision makers are utility maximizers subject to institutional incentives, the decision makers can be influenced by cognitive biases, there is a risk of errors associated with the use of analogies, experts might be biased, and rhetoric can be abused by the parties in the argumentation. The impact of these imperfections and biases is likely to be dependent on whether the procedural system is inquisitorial or adversarial.

Imperfections associated with the inquisitorial procedure

It was explained in Chapter Five that empirical research and literature have suggested that an inquisitorial decision maker is likely to be subject to a prosecutorial bias that systematically favors an evidence assessment in favor of violation. Some of this literature directly addresses antitrust and, in particular, the enforcement of the European Commission. The prosecutorial bias entails both incentive biases and cognitive biases. Since an inquisitorial enforcement authority is rewarded for what it does, it is likely to be subject to an incentive bias in favor of finding violations. The inquisitor is also likely to be subject to a confirmation bias as an element of the prosecutorial bias. The confirmation bias is a cognitive bias. According to the confirmation bias, people tend to assess evidence in a way that confirms already established beliefs. This means that an inquisitor is likely to assess evidence in a way that confirms violation if this is the established hypothesis of the inquisitor.

⁷⁹¹ See Lipton (2004), which was discussed in more detail in Chapter Five of this study.

By using economic modeling, it was shown that the prosecutorial bias has additional consequences for the rationality of evidence assessment than the pure static effect of wrong evidence assessment. The inquisitor has an incentive to excessively search for evidence with strong probative force in support of violation and to search too little for evidence that has probative force in contradiction of violation.

These features associated with the prosecutorial bias are also likely to influence the use of economic models in evidence assessment. In the presence of a prosecutorial bias, the inquisitor is likely to search for data that support their bias, economic models that support their bias, and to apply statistical inference methods that support their bias. The influence of the prosecutorial bias on the generation of models and the inferences made from models will be explored in more detail below.

In addition to the prosecutorial bias, the inquisitor has an incentive to save his own costs by transferring the burden of producing evidence to the investigating parties by the use of presumptions. This will lead to inefficiency in the gathering of evidence. Combined with the confirmation bias, the inquisitor is likely to give too strong probative force to the failure of the parties to produce evidence. Thus, the incentives to reduce costs reinforce the effects of the prosecutorial bias. This incentive to reduce costs is also likely to affect model-based inferences. Presumptions are likely to be based on simple models favoring violations. The details of these mechanisms will be explored in more detail below.

Imperfections associated with the adversarial procedure

When it comes to the adversarial procedure it was found in Chapter Five that the decision makers are not likely to be subject to systematical biases towards either finding violation or finding not violation. This does not mean that the decision maker cannot be biased, just that there is no reason to believe that the decision makers have some systematic preferences for violation or not violation. However, the adversarial procedure is characterized by the parties (represented by lawyers) arguing for their own interest. The parties are likely to try to exploit cognitive biases and other assessment imperfections to the benefit of their case. These imperfections are likely to be exaggerated in laymen jury trials, as juries are not experienced in filtering out and adjusting for imperfections and biases. A crucial topic in this context is how laymen juries are likely to assess economic models and how abusive methods of rhetoric are likely to be exploited to encourage the jury to make wrong inferences from economic models.

Furthermore, since the main rule is that the parties normally choose their own experts to support their arguments, there is likely to be a biased selection of experts, where each party chooses experts with professional preferences that support their case. In addition, even if experts are repeat players and have a reputation to maintain, it cannot be ignored that the experts will make efforts in satisfying their paying clients which will bias the expert opinions away from the purely professional. These biases are likely to influence the data gathering, the models argued for, the methods argued for, and, thus, the model-based inferences. This will be discussed in more detail below.

The adversarial process facilitates an evidence race that tends to lead to excessive evidence production. This is exaggerated by the high stakes of the case. Thus, there is a potential for rent-seeking. One way to implement rent-seeking is to employ high profile economic experts turning the courtroom into a battlefield of experts. This is likely to influence the generation of economic models and the model-based inferences. The dynamics and possible failures associated with the battle of experts will be discussed in more detail below.

However, if the private stakes are low compared to the social stakes, too little evidence may also be produced. If stakes are asymmetric it is likely to be an imbalanced amount of evidence in favor of the party with the high stakes. If we make an assumption that we are likely to observe asymmetric high stakes in cases where a defendant want to protect its monopoly profits, then there might be a systematic bias towards findings of not violation in these cases. No matter the reason for the imbalance of the stakes, the asymmetry is likely to influence the inferences from economic models. It will mean that one party has stronger incentive to provide economic expert evidence and present economic models in their favor. This will also be discussed in more detail below.

The way to proceed

Having repeated some of the main insights and conclusions from Chapter Five and discussed the relevance of these insights and conclusions in the discussion of the actual assessment of economic models in antitrust analysis, the remaining part of this chapter will address the actual assessment of economic models in antitrust analysis. As described in Chapter Five there is a literature focused on identifying sources of imperfections and biases that are likely to facilitate a wrong assessment of economic models in antitrust analysis. Furthermore, as described earlier in this chapter, there is a literature addressing misconceptions in the use of economic models, econometrical analyses and statistical analyses in litigation. An aim of this

chapter is to link this literature by discussing more precisely how the imperfections or biases associated with antitrust decision making are likely to influence the inferences based on economic models, including econometric and statistical analyses. This means discussing how these imperfections are likely to influence the economic models generated in the procedure and the inferences made on the basis of these models. In other words, it will be discussed whether the antitrust procedure is able to bring the right models to the table and whether the models generated in the procedure are likely to be assessed rationally according to their informative value. Ideas and suggestions for improving the assessment of economic models in antitrust analysis will be incorporated in the discussion.

6.4.2 Are the right models generated?

What are the right models?

Before proceeding with the discussion of whether the right models are generated in the antitrust procedure, it is worthwhile to spend a few words on what the right models to be generated are. To answer this question it is necessary to recap the discussion of rational evidence assessment above and in Chapter Five. Beckner and Salop (1999) stated that “[t]he court first should gather information that is least expensive, resolves the most uncertainty, and is most likely to affect its decision”. Chapter Five offered more content to this statement. Rational evidence assessment is about minimizing the sum of the expected loss of errors from making a wrong decision and the cost associated with gathering evidence.

A piece of evidence should be gathered if its decision value exceeds the cost of gathering the evidence. The decision value of evidence is the evidence’s ability to reduce the expected loss from errors. Gathering evidence will only have a decision value if there is a chance that the outcome of the evidence gathering makes it rational to change the decision. In other words, gathering evidence only has decision value if there is any chance that gathering the evidence will influence the decision. The decision value of evidence depends, inter alia, on the probative force of evidence. The probative force of evidence is the extent to which the evidence gathered influences the probability of a hypothesis. In rational evidence assessment, the laws of probability determine the probative force. The decision value is higher the higher the chance gathering evidence will have as an outcome that we with strong probative force are right in changing our decision to a decision associated with a less expected error.

Evidence should be gathered in the right amount and the right sequence. The tradeoff between decision value and cost facilitates the gathering of the right amount of evidence. By

gathering evidence in the right sequence, a rational decision can be taken at each stage. One can then rationally decide whether it is efficient to gather more evidence or to decide upon the evidence already available. The rational sequence of evidence gathering depends on both decision value and costs. The cheapest evidence with the highest decision value should be gathered first. However, dynamical programming is necessary to determine the right sequence of gathering evidence.

These principles of the rational gathering of evidence also apply to economic expert evidence. Thus, the decision of whether to generate a specific economic model depends on its ability to resolve uncertainty and costs. A model should only be generated in the procedure its decision value exceeds the cost. The decision value of a model is, *inter alia* dependent, on its informative value, which was discussed in detail above. This informative value is about the models ability to explain or predict, depending on the purpose of the modeling. The costs can be divided in to several components. There is a cost associated with constructing the model. It will, for instance, usually be more costly tailor a model specifically for the circumstances of the case, than to pick an “off the shelf” standard text-book model. There are some processing costs associated with applying the model, where more complex models are more costly to process. Furthermore, there are costs associated with gathering the data that are necessary to apply the model.

Model generation and selection in an inquisitorial system

The inquisitorial system is characterized by a prosecutorial bias in evidence assessment. The question is how the prosecutorial bias is likely to affect the models generated in antitrust analysis. A prosecutorial bias means that there is a bias in favor of finding violation. There are many ways the prosecutorial bias can affect the generation of economic models.

An incentive to favor violations is likely to influence the experts tasked to generate the models to apply in the case. There is likely to be a selection bias influencing the economists hired as experts in the European Commission, as explained in Chapter Five. Economists are subject to priors, where some are likely to be more pro-intervention than others. Due to the prosecutorial bias, it is likely that the European Commission has an incentive to hire economists that are more pro-interventionist, and thus have a preference for models that yield pro-interventionist inferences.

The incentive element of the prosecutorial bias is likely to influence all stages associated with economic modeling, which thus can be altered to favor finding violation. As described above, the prosecutorial bias is likely affect what evidence is gathered. The

inquisitor can facilitate the finding of violation in the data gathering. The data gatherer may try to find a biased selection of data that will support models that favor violation. In the judicial review of *Tetra/Laval*,⁷⁹² the court found that the Commission had misconstrued the meaning of the available evidence in the reliance on estimates of market growth to reach inaccurate conclusions.⁷⁹³ This is an example on the selection of desirable data to reach the desirable conclusion.

Even with representative data, the prosecutorial bias can be implemented by the generation of models and the inferences based on the models. The inquisitor can choose models with suitable assumptions that are more likely to yield inferences favoring violation. Assume that evidence reveals that some products are strong substitutes. The inference based on a one period Bertrand model of competition would be that the competition is almost perfect. However, a game theoretical model of tacit collusion indicates that a near-monopoly outcome is possible. Thus in assessing a merger using model of tacit collusion is more likely to yield a desirable inference than assuming a model of single-period Bertrand competition. As a model of tacit collusion seems more complicated than a model of Bertrand competition,⁷⁹⁴ the default inference should, rather, be Bertrand competition than tacit collusion in the choice of the most probable among the two models. Thus, the conditions for tacit collusion should be proved. An example where the court found that the European Commission had failed to provide sufficient evidence for using such a more complicated model of tacit collusion was in the *Airtours*⁷⁹⁵ case.

Both in the *Tetra/Laval* case and the *Airtours* case, the flaws of the European Commission were corrected upon judicial review. These cases are likely to have had some influence on the procedural reforms in the European Commission addressed above. More recent decisions involving complex economic analysis have been upheld by the courts. One example is *Ryanair/Aer Lingus*.⁷⁹⁶ It is more difficult to identify obvious examples of prosecutorial bias in this decision. It is not unlikely that the merger was, in fact, anti-competitive and that there was no need for a prosecutorial bias to find violation. Nevertheless, biases cannot be excluded. Testing the impact of the presence of one of the companies on the

⁷⁹² Commission v. Tetra Laval Case T-5/02. Upheld by ECJ in C-12/03 [2005]

⁷⁹³ See Venit (2011) for a discussion.

⁷⁹⁴ The number of implicit assumptions makes it difficult to assess which model is most complicated. However, theory suggests that quite a number of conditions must be satisfied for tacit collusion to be an outcome. See for instance Garces-Tolon et al. (2009).

⁷⁹⁵ *Airtours plc v Commission of the European Communities* Case T-342/99 [2002].

⁷⁹⁶ Case No COMP/M.4439 – *Ryanair / Aer Lingus* [2007] upheld by the court in Cases T-342/07 and T-411/07 *Ryanair Holdings plc and Aer Lingus Group plc v Commission* [2010]

other company's pricing was an important element of the economic analysis of the Commission. The inferences based on such an analysis are dependent whether this is a real impact or just correlation. This is dependent on what variables are exogenous. As pointed out by Commission representatives themselves,⁷⁹⁷ there are issues regarding the quantitative methods applied in the case that may bias the result, such as assumptions of exogeneity. The decision can also be criticized for using ad hoc variables to support their argument. The Commission argued, for instance, for the presence of non-price competition between Ryanair and Aer Lingus, such as quality competition, when it was not able to prove a price effect. Such introduction of ad hoc variables may be argued to reduce the reliability of the inferences made.

Although, the prosecutorial bias is an intrinsic feature of the inquisitorial procedure, the judicial review of the European Commission decisions in cases such as *Airtours* and *Tetra/Laval* has disciplined the Commission. This means that the discretion of the European Commission in implementing the prosecutorial biases has been reduced. Since the judicial review is restricted when it comes to the assessment of complex economic evidence, it is likely that it is in the context of complex economic evidence that the prosecutorial bias will be found. The use of "data rooms" and other measures suggested in the Commission best practices on the submission of economic evidence imposes additional constraints on the implementation of prosecutorial biases.⁷⁹⁸ Failures in the data gathering, assumptions imposed on the data, or the use of basic models based on assumptions without merits in the facts of the case are likely to be discovered and to be quickly sanctioned by the courts within the standard of judicial review. Thus, it is more likely that the Commission will use models that cannot easily be falsified.

One obvious candidate for implementing the prosecutorial bias is in the use of game theoretical models. If there is nothing to object on the use of model assumptions as such and their basis in the real world data, the European Commission is likely to favor or exaggerate the risk of anticompetitive equilibriums outcomes. It is hard to challenge the discretion used in the determination of the likelihood of different possible equilibriums. An interesting observation in this context is that game theory-models seem to be more influential in areas where they are likely provide inferences of anticompetitive effects, such as horizontal agreements and mergers than in the study of unilateral behavior. Game theory-based models

⁷⁹⁷ De La Mano et al. (2007)

⁷⁹⁸ See the European Commission Best practices on the submission of economic evidence, op. cit., Paragraph 47.

seem to be influential both in the guidelines of horizontal cooperation agreements,⁷⁹⁹ and in the horizontal merger guidelines.⁸⁰⁰ For instance are the coordination aspects of information exchange given careful attention in the guidelines of horizontal cooperation, as an instrument to facilitate coordination. Models of tacit collusion are given substantial attention in the merger guidelines. In the study of unilateral behavior, game theory tends to question the rationality of the anticompetitive motivation of certain behavior, such as predatory pricing, bundling, or exclusive dealing. An exclusive dealing agreement, may, for instance, at first sight seem anticompetitive. However, a careful scrutiny taking into account the incentives of all parties involved may reveal that the customers will not accept an exclusivity agreement if it is anticompetitive unless certain assumptions are satisfied.⁸⁰¹ Therefore, it is interesting to observe that game theory models do not seem to be very influential for the European Commission in informing the effects of these kinds of conduct.⁸⁰² A premium example is perhaps the doctrine of predatory pricing, based on cost-based tests.⁸⁰³

Thus, the prosecutorial bias is likely to bias generation of models in the inquisitorial procedure. Thus, it is not only the informative value of the models and the costs that govern the models generated in the procedure, but also a bias towards finding violation. Models that tend to favor violation will likely be explored first, while models that are likely to contradict violation will be underexplored. Thus, the prosecutorial bias is likely to prevent the most informative models to be generated for inference, to the benefit for those models that most satisfy the prosecutorial bias. It is not possible to say that this bias, generally, will also increase the costs associated with evidence gathering. In some situations, models favoring violation will be more complex, and thus more costly to process and apply. This will typically apply in the generation of complicated models of coordination that favors violation. In other

⁷⁹⁹ Communication from the Commission - Guidelines on the applicability of Article 101 of the Treaty on the Functioning of the European Union to horizontal co-operation agreements Official Journal C11, 14.1.2011, p. 1.

⁸⁰⁰ Guidelines on the assessment of horizontal mergers under the Council Regulation on the control of concentrations between undertakings (2004/C 31/03).

⁸⁰¹ See, for instance, Aghion and Bolton (1987), Rasmusen et al. (1991), Segal and Whinston (2000), and Ordover et. al (1990). New literature in antitrust economics and industrial organization usually surveys models of exclusionary practices. See, for instance, Motta (2004), Church and Ware (2000), Carlton and Perloff (2005), and Belleflamme and Peitz (2010).

⁸⁰² See also *Tomra ASA and others v. European Commission* Case T-155/06 [2010]. Upheld by the ECJ in Case C-549/10 P [2012] concerning rebates. See also Communication from the Commission — Guidance on the Commission's enforcement priorities in applying Article 82 of the EC Treaty to abusive exclusionary conduct by dominant undertakings OJ C 45, 24.2.2009, p. 7–20, where game theoretical models don't seem to have a prominent role.

⁸⁰³ See Communication from the Commission — Guidance on the Commission's enforcement priorities in applying Article 82 of the EC Treaty to abusive exclusionary conduct by dominant undertakings OJ C 45, 24.2.2009, p. 7–20

situations, simpler models are more likely to support violation, and more costly models are not likely to be explored, even they have informative merits. This will typically apply in models of exclusionary behavior, as described above.

Model generation and selection by in an adversarial procedure with party experts

From a decision theoretic point of view, models should be gathered to resolve uncertainty at as low costs as possible, as explained above. There are several reasons why the models generated in an adversarial procedure are likely to deviate from those models that should be generated from a decision theoretic point of view. An adversarial system is characterized by each party advocating their own interests. The models are not generated to objectively resolve uncertainty. They are generated to provide favorable inferences for the parties. It is the stakes of the parties that are determining for whether a model is generated and not the social value of the model's capability to resolve uncertainty. Thus, it is not an objective assessment of decision value against costs that determines the generation of models. There is a risk of several biases when models are presented by experts hired by parties on each side. Experts are subject to both a selection bias and incentive bias. Both these biases are likely to influence the models generated in the litigation.

A party is likely to select an expert both on the basis of an expert's priors and how the evidence of the specific case is likely to be interpreted by the expert. These two issues are, of course, interrelated, as the data will be interpreted in light of the priors. The expert is both selected on the basis of his general a priori attitude towards the conduct in question and on how the expert has interpreted evidence in similar cases earlier. Some experts are likely to be pro-plaintiff and some are likely to be pro-defendant.⁸⁰⁴ A question is how such selection biases actually influence the models generated in the procedure. One way the selection bias may influence the generation of models is the choice of assumptions that underpin the models chosen. Some economists tend to make assumptions that have the result that the market fixes itself without government intervention.⁸⁰⁵ Some economists may, for instance, tend to impose stronger restrictions on the rationality of all parties involved and emphasize how rational agents are likely to adapt to certain conduct in a way that mitigates competitive problems. An example of this is the analysis of vertical restraints as described above. An example of such vertical restraint is exclusive dealing where game theoretical models indicate that exclusive

⁸⁰⁴ See Posner (1999b).

⁸⁰⁵ See for instance the discussion on the Chicago-school in the discussion of economic models in antitrust analysis above.

dealing is harmful to consumer welfare under very special circumstances. Furthermore, even if experts agree upon the right model to apply for inferences, they may disagree on the likely equilibrium of the model. This means that the experts may rely on different refinement assumptions that are determining for the equilibrium. Pro-plaintiff experts are likely to favor anticompetitive equilibriums, while pro-defendant experts are likely to favor pro-competitive equilibriums.

If experts, in addition to the selection bias, have strong incentives to satisfy the client, they have several opportunities in doing so. An expert may use several instruments to generate economic models yielding the desirable inferences. An expert may search for models and yield the desirable inference, for instance, by making suitable assumptions. The expert can, for instance, strategically choose what variables to consider as exogenous. If the expert uses quantitative methods a range of possibilities opens to make suitable inferences. The expert may try to find a biased data set that is more likely to support desirable models. The expert may strategically choose what hypothesis to test. Assume, for instance, that the expert wants to testify that a market is wide. He might then formulate a test hypothesis based on a wide market that cannot be rejected at a five percent significance level and then argue for a wide market. Assume, instead, that the expert wants to test that a market is narrow. He might then base a hypothesis on a narrow market that cannot be rejected. Both these tests may be consistent with the same data and even the same methodology. The only difference is the underlying “model” used for inference. It is the logic used in the inferences argued for that is wrong. The expert may also utilize data mining techniques to find out exactly what models that will give the desirable result. The opportunities are almost endless.

An example of the utilization of such methods is *Conwood*⁸⁰⁶. In this case Conwood accused the competitor, US Tobacco, to exclude Conwood by various anticompetitive methods and claimed damages. In this case, the plaintiff expert used quantitative analysis to argue for the impact of some alleged anticompetitive behavior. The expert “proved” a statistical trend of Conwood’s market shares to have decreased. The problem was, however, that the conclusion was dependent on one outlier. If this outlier was taken out the conclusions could have been the opposite.⁸⁰⁷ The analysis of the plaintiff expert has later been proven to be substantially flawed.⁸⁰⁸ The outlier problem was not the only flaw. The expert argued for an inference that the growth in market share was positively correlated with the market share

⁸⁰⁶ *Conwood Co. v. United States Tobacco Co*, 290 F. 3d 768 (6th. Cir 2002).

⁸⁰⁷ See Hovenkamp (2005b) p. 80 f. and Kaye (2001).

⁸⁰⁸ See Kaye (2001) for a technical discussion.

was evidence for anticompetitive behavior. However, this had no grounding in economic theory. Besides, this evidence alone does not establish any causal link to the alleged anticompetitive behavior.⁸⁰⁹

The application of the Daubert standard is supposed to screen off extreme instances of flawed model-based inferences. Several examples indicate that that the Daubert standard has partially succeeded in doing so. However, experiences have also revealed that the Daubert standard has failed in screening off flawed models.⁸¹⁰ One example is the *Conwood* case just mentioned.

After the Daubert standard screening has been performed, the decision maker is likely to face two or more models that are reliable and valid enough to have passed. The decision maker will incorporate all the model-based inferences from the various models in a holistic assessment of evidence based on a search of the best explanation. The actual assessment of the informative value of models will be discussed below. However, a question that can be addressed already here is whether the decision maker, de facto, has the information of the best model present when he has been presented with a bundle of models that all incorporate the elements that should be in the best model. As discussed in Chapter Five, it has been pointed out in the literature that the competition between parties in an adversarial process is likely to neutralize the impact from biased influences on each side.⁸¹¹ Does the adversarial procedure produce biased economic models that, in the end, give the same information as a “neutral” unbiased economic model? The answer to this is generally, no. There is likely to be more information in analyzing two or more models together than the separate information contained in the two models. This can be illustrated with a simplified example. Assume that a plaintiff uses the following model for inference:

$$P = \alpha_0 + \alpha_1 D + \varepsilon.$$

P is the price, and D is a dummy indicator for the presence of some illegal action. The defendant may, however, rely on the following model to explain price changes:

$$P = \beta_0 + \beta_1 C + \varepsilon.$$

⁸⁰⁹ See Hovenkamp (2005b) p. 80 f. and Kaye (2001).

⁸¹⁰ Hovenkamp (2005b) p. 84 f.

⁸¹¹ Froeb and Kobayashi (1996, 2001). See Parisi (2002) for a discussion. A recent experimental study is Boudreau and McCubbins (2008).

Here, c is the cost. It might be that both α_1 and β_1 are significant and that both of these models are informative as both cost and the illegal action explain the price level. However, an analysis of these two models separately does not provide the same information as an analysis of the combined model:

$$P = \gamma_0 + \gamma_1 D + \gamma_2 c + \varepsilon$$

Analysis of this model makes it possible to check the interdependence between γ_1 and γ_2 and whether each parameter is significant in the presence of the other. The predictive and explanatory power of this model is also likely to be stronger than each of the models independently.

Posner (1999b) suggests several measures to deter party-appointed expert witnesses from providing biased opinions. Posner suggests a system to keep track of economic experts and their testified opinions and make them public. In this case, it will be easier revealed if the experts adjust the opinions to satisfy their clients. It is hard to fully agree with the appropriateness of this measure to address biases. It may mitigate the incentive bias, but not the selection bias. Under this system the, expert has to be consistently biased which may segregate the pro-plaintiff and pro-defendant experts even further. It could also be argued that this arrangement will make it easier for the parties to find experts who will provide the opinion they want.

The discovery procedure in US civil procedure⁸¹² is also likely to play a deterrent role. According to the discovery rules, much of the economic analyses done by the parties pre-trial will be available to the opposite party during discovery. This will reduce the incentive for parties to shop for expert opinions to find a preferable one. Posner (1999b) suggests an extension of this pre-trial obligation to also notify what experts that have been asked to provide expert opinion for a party, but refused. There are reasons to be skeptical to expand discovery obligations even further in such a way. Involving experts is a part of planning the legal strategy. A too strong obligation may easily interfere with the benefits associated with the attorney-client privilege. This might discourage the use of experts. If one believes that the use of experts, despite its deficiencies, contributes to more accuracy, the result of such obligations may be less accuracy of antitrust decisions. More research on the law and

⁸¹² Federal Rules of Civil Procedure, Rule 26a.

economics of discovery obligations to reveal expert opinions in antitrust litigation would probably pay off in terms of enlightening this issue.

Model generation and selection in the presence of neutral experts

In the US, the courts have the power to appoint neutral experts.⁸¹³ The expert may be appointed both on a motion of one of the parties or on the initiative of the court. The opportunity to appoint neutral experts has traditionally rarely been used in antitrust cases, although there has been an increasing trend in using it the last decades.⁸¹⁴ Court-ordered expert reports are the general instrument of including experts in the judicial review in the EU courts.⁸¹⁵ This is rarely used in EU competition cases. However, it has been used in a few occasions.⁸¹⁶ Expert reports were for instance ordered in *Woodpulp*⁸¹⁷ and *ICI*.⁸¹⁸ Experts may be examined by the parties in both the US and EU. The question is whether the model generation in antitrust procedure is improved if neutral experts are given the task to provide the models, compared to the situation where the models are provided by an inquisitor or by the parties in an adversarial procedure.

Neutral experts appointed by the court are not subject to the systematic biases associated with experts employed by an inquisitor or party appointed experts in an adversarial trial. This lack of bias should be an argument for neutral experts. However, the lack of systematic biases in the use of neutral experts does not mean that the expert is not biased.⁸¹⁹ The neutral expert is likely to be subject to several biases. Even if an expert is not selected on the basis of a bias, he might still be subject to the same professional bias. The chosen expert may be subject to pro-plaintiff or pro-defendant biases. Still, a neutral expert does not have the same incentive to satisfy its principal as a party-appointed expert. Furthermore, the ability of the parties to object to the appointment of a particular expert and the possibility to cross-examine the expert may reveal and mitigate the influence of biases. However, a problem is that, on the contrary to the party-appointed experts, it is more difficult to predict the bias of a neutral expert. The eventual bias of the expert must be derived from various factors, such as

⁸¹³ Federal Rules of Evidence, Rule 706.

⁸¹⁴ See Posner (1999b) and Lipsky (2003).

⁸¹⁵ Rules of Procedure of the Court of Justice of the European Communities of 19 June 1991 (OJ L 176 of 4.7.1991, p. 7, and OJ L 383 of 29.12.1992 (corrigenda)), Article 47, and Rules of Procedure of the Court of First Instance of the European Communities of 2 May 1991 (OJ L 136 of 30.5.1991, p. 1, and OJ L 317 of 19.11.1991, p. 34 (corrigenda)), Article 70. See Lianos (2010).

⁸¹⁶ See Lianos (2010).

⁸¹⁷ Joined Cases C-89, 104, 114, 116, 117 & 125–129/85, *Ahlström & Others v. Commission* [1993] ECR I

⁸¹⁸ Case 48/69, *ICI v. Commission* [1973] ECR 619

⁸¹⁹ See Bernstein (2008) for a discussion. See also Lianos (2010).

previous research and statements, and the possible biases of the judge who appointed the expert. Economic models of litigation show that parties can at least mitigate some influence of biases by presenting arguments and evidence.⁸²⁰ Thus, if the parties know the bias of a person advising the court this can be partially mitigated by the parties. However, this will be more difficult for the parties if they cannot predict the direction of the bias of the neutral expert.

Besides the eventual professional biases of the expert, the neutral expert may not have the correct incentives aligned with rationality in weighing the decision value of applying a model against the costs. This depends on the award mechanisms. The expert is normally awarded directly by hourly payment. This hourly payment is likely to be standardized and not dependent on the public stakes of the case. Thus, the expert's incentives are not likely to be perfectly aligned with the public interests. The expert is also subject to indirect awards. An influence on the experts' academic merits may be one such indirect award. If so, the expert would probably be more interested in showing his capacity in applying and developing advanced methods than mechanical data gathering. Thus, there might be a bias towards the use of advanced methods based on assumptions rather than simple, but data intensive methods.⁸²¹ If the neutral expert is an expert that also regularly testifies as an expert witness, this might also affect the incentives. The expert may have some interest in signaling special capabilities in applying some special methods. Thus, although neutral experts may seem to be less biased, this may not be the case. The bias is less systematic though. Still, even if the expert should be less biased, the bias may still have a greater impact on the decision. The reason is that the decision maker may rely more on the expert and be less critical to the expert opinion under the belief that since expert is neutral he is also unbiased.

Although there are potential problems associated with neutral experts, the use of neutral experts to supply expert witnesses in antitrust has been advocated by some of today's leading antitrust scholars.⁸²² To mitigate the selection bias, it has been suggested that each party could write a list of acceptable experts, and then the expert appointed should be one that appear on both lists.⁸²³ The role of the expert may not necessarily be to generate economic

⁸²⁰ See Froeb and Kobayashi (1996) and Farmer and Pecorino (2000) for a critique. See also Sanchrigo (2012). This was discussed in more detail in the chapter on rationality in evidence assessment.

⁸²¹ Note that this is not a general tradeoff. While advanced methods in some instances can substitute the need for data, advanced methods may also be very data intensive.

⁸²² Posner (1999b) and Hovenkamp (2005b) p. 89 f.

⁸²³ See Rubinfeld (1985) and Posner (1999, 1999b). This idea is supported by Hovenkamp (2005b) p. 90.

models, but to provide an opinion based on the economic analysis provided by the parties.⁸²⁴ An expert opinion could be produced after the main presentation of economic evidence by the parties, and then be subject to contradiction on the parties. Such an arrangement would impose a strong time-pressure on the neutral expert as the neutral expert not only must take into account the pre-trial evidence, but also the oral presentations of the party experts. Still, the job is less than to actually produce the evidence, as the task is to provide a critique of the evidence presented. A possible task to give the neutral expert may also be to generate full models based on the partial models generated by the party-appointed experts as explained above. Then the decision makers are likely to benefit from models that provide more information. Furthermore, the expert could have a role in advising the court on what presumptions that should be based on the models generated. It would then be up to the parties disfavored by the presumption to generate better models. The opinion of the neutral expert should, preferably, be a separate public document that is amended to the decision. If the legal decision includes a written assessment of evidence, as recommended in Chapter Five in this study, it would be possible to see the extent the decision makers' have relied on the report of the neutral expert and how the contradiction by the parties on this report has influenced the evidence assessment.

Some comments on model generation

It is now discussed how various mechanisms of incorporating economic experts under various procedural arrangements are likely to influence the economic models generated. The prosecutorial bias in an inquisitorial procedure and the use of party-appointed expert witnesses in the adversarial procedure are likely to bias the models generated away from those models that should be generated based on a tradeoff between decision value and costs. Furthermore, it was shown that the sum of the information value of models generated by the parties in an adversarial process is less than the information value of a model combining the insight of the two models. It was discussed whether the use of neutral experts performs better than party appointed experts. On this issue it was found that neutral experts may mitigate the systematic selection bias, but that this does not eliminate the professional bias. Furthermore, it can be questioned as to whether the award mechanism of neutral experts aligns the neutral expert incentives with the incentives compatible with the rational generation of models. It can also be questioned whether eventual biases will have greater impact if experts are neutral,

⁸²⁴ Posner (1999b) and Hovenkamp (2005b) p. 90 f.

because the decision maker will be less critical to the expert report under the belief that neutrality also means to not be biased.

Still, the use of neutral experts is recommended by leading antitrust scholars and measures to limit the bias of the neutral expert are suggested. Such measures includes mechanisms such as appointing an expert agreed upon by both parties and limiting the role of the neutral expert to assess the expert evidence already provided by the parties. The report of a neutral expert could be provided after the presentation of economic expert evidence by the parties and be subject to contradiction by the parties. By a requirement of the judges to provide grounds on the evidence assessment, it could be monitored if the decision makers have assessed the expert report properly taking the results of contradiction into account.

Model generation in antitrust procedure is now discussed. The rationality of the weight the decision maker actually gives to the models generated by the procedure depends on the decision makers' incentives and abilities to assess models according to their informative value. The problem of biased models becomes bigger if the decision makers actually give too high an information value to the wrong models or too low an information value to the right models. This will be the topic next.

6.4.3 Will models be assessed according to their informative value?

Models in abductive reasoning

In Chapter Five, it was found that abductive reasoning is descriptive for the actual assessment of antitrust evidence.⁸²⁵ Abductive reasoning is a holistic, informal method of searching for plausible explanations of evidence in the ultimate search for the best explanation of evidence. The use of presumptions, analogies and expert knowledge, are all crucial elements of abductive reasoning. Inferences based on economic models are in the category of expert knowledge. Inferences based on economic models are just elements of the holistic assessment of evidence. A statement by Alexander Italianer, Director General of the Directorate for Competition in the European Commission, is illustrative. Italianer stated that

*[w]e take into account quantitative and qualitative information to put together a coherent story [...] We need to tell a story where economic evidence and analysis validates these presumption.*⁸²⁶

⁸²⁵ See also Lianos (2010).

⁸²⁶ Alexander Italianer, "Quantity" and "quality" in economic assessments, Charles River Associates Annual Conference 7 December 2011, Brussels.

Thus, the analysis based on economic models is a component of a holistic assessment of evidence in establishing a coherent story. The role of the models is to support and validate the presumptions based on other evidence.

Lipton (2004) concludes that a holistic inference to the best explanation of evidence as a main rule yields a correct assessment of evidence. The question is whether there are imperfections and biases distorting the evidence assessment. This principle must also apply if the evidence includes inferences based on economic models. In fact, Lipton (2004) is a philosophy of science treatise, and the main context of his study is the assessment of scientific evidence. The question is, then, whether there are imperfections and biases associated with the assessment of antitrust evidence having the result that the antitrust decision maker makes wrong inferences from economic models. Such imperfections and biases in general were discussed in Chapter Five. This included, inter alia, how institutional biases may affect evidence assessment, how evidence assessment may be distorted by cognitive biases, and how abuse of rhetoric may be utilized to influence the decision makers to make wrong inferences from the evidence. Here it will be discussed how these imperfections in particular are likely to lead to an assessment of economic models contrary to the true informative value of the models. The previous subchapter discussed the generation of economic models in antitrust procedure. In this section, the question is whether correct weight will be given to these models according to their informative value.

Imperfections in model assessments in an inquisitorial systems

Above it was discussed how the prosecutorial bias affects model generation in an inquisitorial system. The next question of whether the models are assessed according to their informative value almost becomes almost superfluous. If the inquisitor made a correction for the reduced informative value following from the influence of the prosecutorial bias on the generation of models, there would be no prosecutorial bias.

The prosecutorial bias can be divided into incentive biases and cognitive biases. If the bias is a cognitive bias, the decision maker does not intentionally assess the evidence wrong. He is just subject to some cognitive failures. A main component of the prosecutorial bias is the confirmation bias, which in the context of the prosecutorial bias means that evidence is interpreted in favor of violation. In the context of assessing the informative value of models, this means that a model with inferences supporting violation will be given too high weight, while models that contradict violation will be given to low weight compared to the correct informative value. By using the terms of Alexander Italianer referred to above, the inquisitor

is likely to prefer models that put together a coherent anticompetitive story. The confirmation bias may not only affect the weight given to competing models, but also the weight given to the various equilibriums predicted by a model. If, for instance, a model applied has several equilibriums, some competitive and some anticompetitive, too much weight is likely to be given to the likelihood of the anticompetitive outcome. As discussed above, the inquisitor is, for instance, likely to give excessive weights to coordinated equilibriums in models of oligopoly if this supports intervention.

The prosecutorial bias also consists of an incentive bias. The incentive bias follows from an excessive preference for finding violation relative to finding not violation. The reason is, inter alia, that an inquisitor is awarded more for visible actions than for non-visible actions. In the pursuit of this preference, the inquisitor has an incentive to give higher weight to models that provide desirable inferences in support of violation. However in performing this task, the inquisitor must take into account that the weight given to the models must survive the scrutiny of judicial review and that of the audience in general. In the EU, the limited review on the assessment of complex economic evidence might induce the European Commission to give high weight to desirable inferences based on complex economic models, as the judicial review is restricted on this matter. A deliberate attempt to convince the decision maker to give too high weight to the inferences following from a specific model would involve the abuse of rhetoric in model-based inferences. The abuse of rhetoric in the argumentation for inferences based on economic models is returned to below.

Imperfections in model assessments in an adversarial procedure

In the adversarial process, it is the parties supported by their expert witnesses or, eventually, a neutral expert, which present the economic models and argue for the inferences based on these models. The decision makers, who might be judges or jurors, decide what weight to give to these models.

The decision maker may be subject to some incentive biases in assessing models that are not likely to systematically favor violation or non-violation. Understanding complex economic models and, especially, advanced econometric models requires much effort. Thus, instead of incurring the effort of understanding the complex model, the decision maker has an incentive to give less weight to complex models than easier, understandable models. However, note that it could also be argued for the opposite. If the decision maker does not understand the model, he might give weight to the conclusions according to the credentials of the experts, and not the model as such. This might result in a too high weight given to the

inferences supported by the model. Experiences seem to indicate that the first argument applies better to judges.⁸²⁷ This means that if judges do not understand the logic behind the inferences based on a complex economic model, this will simply not be taken into account or at least not be given much weight.

Reducing the costs of assessing complex evidence is an argument for better trained decision makers. Some empirical studies seem to indicate that economic training of judges produces better antitrust decisions.⁸²⁸ However, if the decision maker is too trained, in terms of being an antitrust expert himself, he might be subject to professional biases, in particular, a professional confirmation bias. The decision maker would then be likely to give more weight to models that are on terms with his own research. Thus, to promote a rational assessment of economic models it is probably a case for having better trained decision makers, but not too trained decision makers. It should also be noted in this context that economic experts may have an advantage in assessing complex economic evidence. However, assessing antitrust evidence also involves assessing regular issues such as the credibility of non-expert witnesses, the validity of documents, and the state of mind of the persons involved. The economic expert is not likely to have any advantage in assessing these kinds of evidence. The expert may, in this case, rely too much on the economic models in the total evidence assessment and understate the informative value of other evidence. This is an additional argument against using experts in antitrust economics as decision makers.

The decision makers are also likely to be subject to cognitive biases in the assessment of economic models. Chapter Five presented and discussed a range of cognitive biases that are likely to influence evidence assessment. Most of the types of cognitive biases are relevant for the assessment of economic models. The base rate fallacy means to not give sufficient weight to priors. In the application of frequentistic statistical methods the base-rate fallacy is particular present. As explained above, many of the frequentistic methods are based on the probability of observations given a hypothesis. Making inferences on the probability of observations alone given the hypothesis, and not taking the base rates into account, is what the base rate fallacy is about. Thus, if the decision maker gives weight to models based on frequentistic tests not taking base rates properly into account, there is a risk of base rate fallacy. The conjunction fallacy means to believe in a hypothesis with more assumptions since the assumptions provide more understanding, although a hypothesis with less assumption is more probable. The conjunction fallacy is also relevant for the assessment of economic

⁸²⁷ OECD (2008).

⁸²⁸ See Baye and Wright (2011).

models. It is in the nature of modeling to make assumptions. If an expert uses a model with more explicit assumptions that seems to provide more understanding than a model with fewer assumptions, then the first model is likely to be given more weight than the second according to the conjunction fallacy. Still, the second hypothesis is more likely. The hindsight bias is also relevant for economic models. Assume there is a question regarding the possibility of a company to foresee the anticompetitive effects of some actions that actually materialized. It is established that the company could have used two economic models to predict the consequences of its behavior. The hindsight bias tells us that the decision maker is likely to exaggerate the ex-ante weight that the company should have been given to the model that predicted the anticompetitive effects. Also the self-serving bias may have some impact in the assessment of the models. The model that is more in line with what the decision maker wants to believe is, according to the self-serving bias, also likely to be given excessive weight.

As discussed in Chapter Five, jurors are likely to be more apt to be influenced by cognitive biases than experienced decision makers. However, when it comes to the assessment of complex economic models jurist judges without training in scientific methods may be as susceptible to cognitive biases as jurors. A financial expert or a physicist among the jurors may be equally qualified in assessing complex economic models as a jurist judge. Furthermore, empirical studies seem to indicate that, although training judges in economics improves the decisions in antitrust cases involving normal economic evidence, training in basic economics does not seem to be of much help when the economic evidence is complex.⁸²⁹ As an alternative to training in economics, it would have been interesting to see how training in philosophy of science and basic statistics would help to improve the decision making in the presence of complex economic evidence. Training in basic economics does not necessarily provide much training in the assessment of statistical and econometrical methods. Training in basic statistics would probably be more beneficial than training in basic economics when it comes to the assessment of econometrical and statistical methods.

The adversarial procedure provides an arena for rent-seeking. The parties have incentives to use abuse of rhetoric in the argumentation for inferences based on economic models to exploit imperfections and biases in the decisions makers. The abuse of rhetoric in the argumentation for model-based inferences will be discussed just below.

⁸²⁹ See Baye and Wright (2011).

Abuse of rhetoric and model based inferences

As stated above, both the inquisitorial decision makers and the parties in an adversarial process have an incentive to abuse rhetoric in the argument for inferences based on economic models. The inquisitor may want to convince the general audience, and, in particular, the courts that their model-based inferences are correct in case of review. In an adversarial process, the parties want to convince the judges or jurors. This section provides a discussion of how abuse of rhetoric may be utilized to convince the decision makers to assess the inferences of economic models on the contrary to its information value.

Recall from Chapter Five that the following ideal requirements characterize the correct use of rhetoric⁸³⁰:

- (R₁): The respondent accepts the premises as commitments
- (R₂): Each inference in the chain of argument is structurally correct
- (R₃): The chain of argumentation must have the proponent's thesis as its ultimate conclusion
- (R₄): Arguments meeting (R₁)–(R₃) are the only means that count as fulfilling the proponent's goal in the dialogue

A party that convinces a decision maker by means that violates (R₁)–(R₄) has abused rhetoric.

(R₁) means that the decision maker as the respondent must accept the premises used by the one who present the argument. Trying to confuse the decision maker to accept assumptions the decision maker has not accepted would be an abuse of rhetoric. This is, in particular, relevant in the application of economic modeling. As described above, an economic model consists of some explicit assumptions and an almost infinite set of implicit assumptions. The decision maker is not likely to be aware of all these assumption, and might well not accept an assumption that is crucial for the outcome of the model. The *Conwood*⁸³¹ case discussed above is illustrative. Here, the plaintiff expert's model was based on the assumption that a higher growth in market shares in markets where the market share already was high was evidence of the effects of the alleged anticompetitive behavior of the defendant. The assumptions for this to be a valid inference are not in line with standard economic theory. If the assumptions for this inference to be valid were explicit stated, the inference would probably not be accepted by the decision makers.

⁸³⁰ Walton (2002), Chapter 7.

⁸³¹ *Conwood Co. v. United States Tobacco Co*, 290 F. 3d 768 (6th. Cir 2002).

When the models are calibrated by data by econometric methods, even more assumptions are imposed as econometric analysis requires assumptions regarding the structure of the data. The methods of statistical parameter inference described above are based on the assumption that the rest of the model is true, as explained above. The stated uncertainties associated with the inferences associated with standard methods such as significance testing and deriving p-values, usually do not take into account the uncertainty associated with the model as such. This is an additional uncertainty the decision makers are not likely to be aware of. This can be exploited by those who present the analysis giving an impression that the inferences are more accurate than they are.

Thus, expert testimony based on economic models provides, as a starting point, an ideal playground for abuse of rhetoric. In the US adversarial procedure, the admissibility screening according to the Daubert standard is a first-line defense against the abuse of rhetoric by the means of dubious assumption. Later, the competing argumentation of the opposing parties is supposed to reveal attempts to use hidden assumptions to yield accurate results. However, hidden assumptions may not always be revealed. Sometimes, qualified economists who are experts on the relevant area are necessary to reveal such hidden assumptions. Thus, the revelation of hidden assumptions requires that the stakes for the opposing party are so high that they find it valuable to hire experts to reveal the fallacies and flaws in the opponent's economic analysis. If the stakes are very asymmetric, the party with the high stakes may have an incentive to overwhelm the court with expert testimonies, which will reduce the chance that the opposing party will reveal the hidden assumptions.

In an inquisitorial procedure, there is not an opposite party to the same extent as in the adversarial procedure; however, the investigated parties are involved in the contradiction. The best practices on the submission of economic evidence in the EU have improved the use of economic analysis in the process. For instance, the use of data rooms makes it possible to check the validity of assumptions made on the data.⁸³² Still, the European Commission has discretion in interpreting the data and the choice of models. Furthermore, the judicial review of complex economic evidence is restricted. This makes it possible for the European Commission to exaggerate the weight of model-based inferences despite of hidden dubious assumptions.

(R₂) means that the inferences based on economic models must be logically valid. Above, several examples were presented on how inferences based on economic models

⁸³² See the European Commission Best practices on the submission of economic evidence, op. cit., Paragraph 47.

argued for do not need to be valid. The party may try to exploit cognitive biases in the decision makers to give a wrong information value to a model. A party may, for instance, try to develop a model which includes some assumptions that are not necessary for the modeling but still appear to provide more understanding for a decision maker by exploiting the conjunction fallacy. One could, for instance, add some assumption to a model that the potential participants in an alleged conspiracy had low margins for a long period. This assumption may bring nothing to the model in terms of different inferences,⁸³³ though it may appear as a better model for the decision maker because the assumption provides more understanding. Thus, adding an assumption, which all equal else reduces the informative value of the model, will make the model to look more informative to the decision maker.

The party may also exploit methods of statistical inference in violation of (R₂). Recall from the description above that statistical significance testing is asymmetric. Finding some parameter significant at significance level α means that the probability of the observations or more extreme observations are less than α percent given that the parameter is zero and that the rest of the assumptions behind the model are valid. However, not finding significance does not mean that it is $100-\alpha$ percent chance that the parameter is zero. It might be much more probable that the parameter is positive than that the parameter is zero, as described above. Thus, it would be logically incorrect to argue that a failure to find significance is strong evidence that a parameter is zero. Testing significance is, at best, informative for the rejection of a hypothesis, but not its confirmation. Still, this basic distinction may be difficult to understand by untrained decision makers. Such an assessment fallacy could be exploited by the parties. As it is more difficult to reject a hypothesis than to fail to reject a hypothesis, a party could support a weak argument by formulating a favorable hypothesis that cannot be rejected, and use this to argue for the truth of the hypothesis.

A remark that is almost too obvious to be mentioned is the difference between statistical significance and numerical significance. That a parameter is significantly different from zero does not mean that the numerical value of the parameter is “significant”. Thus, an argument based on an inference from statistical significance to numerical significance would be invalid. However, experiences seem to indicate that even this crucial distinction is likely to be misunderstood in courts.⁸³⁴

⁸³³ However, it is not unthinkable that it is possible to construct models where low margins for a long time have some influence on the likelihood of a price conspiracy. It might, for instance, be that if a firm had low margins for a long time then it has fewer assets that could be subject to fines. However, if this assumption is used and is crucial for the inference, the validity of the assumption should be proved.

⁸³⁴ See Greenland and Poole (2011).

As described above, finding parameters significant is not very informative in the determination of informative value of the model. It is, rather, assumed that the model is informative. A model where one or more parameters are significant does not need to be very informative for explanation and prediction. In fact, a parameter may be found significant in a model with low informative value. If the decision maker gives the predictions from the model high weight just because parameters are found significant, then this would be a fallacy.

(R₃) is also likely to be violated when it comes to argumentation based on economic models in antitrust analysis. Economic models are used in proving that the legal conditions are satisfied. As described above, models are used to inform the antitrust decision maker as to whether some action was anticompetitive or that some action has anticompetitive effects. Often, one cannot directly model the anti-competitive effects, but something else that the decision maker is supposed to use as evidence to infer anticompetitive effects. For instance, in the EU *Ryanair/Aer Lingus*⁸³⁵ case, the economic evidence did not directly prove that the merger had competitive effects. However, economic models and econometric analysis was used as evidence that the merging parties were likely to discipline each other's price. This was used as evidence to infer that the merger had anticompetitive effects. This is normally no problem, as long as there is an established theory leading from what is proved to what is going to be proved, which there was in this case. However, one could use economic analysis to prove something else and then abuse rhetoric to confuse the decision maker into making the wrong inferences. Thus, an expert may present some results and confuse the decision maker to make the desirable inferences from it. The *Conwood*⁸³⁶ case is probably an illustrative example of this. In this case, the plaintiff's economics expert proved that the plaintiff's market share had a tendency to grow less when its market share was low compared to when it was high. This was supposed to be evidence in support of exclusion. It is difficult to know whether the expert actually believed this had probative force in favor of violation, but on its face it seems to be an attempt to prove "something" with advanced methods with a hope that the decision maker was confused into concluding that since advanced methods are used by an expert, it must prove something.

The discussion above has shown that argumentation based on inferences from economic models is a good arena for the abuse of rhetoric. All elements necessary for

⁸³⁵ Case No COMP/M.4439 – Ryanair / Aer Lingus [2007] upheld by the court in Cases T-342/07 and T-411/07 *Ryanair Holdings plc and Aer Lingus Group plc v. Commission* [2010]

⁸³⁵ De La Mano et al. (2007).

⁸³⁶ *Conwood Co. v. United States Tobacco Co.*, 290 F. 3d 768 (6th. Cir 2002).

establishing logically valid arguments could potentially be violated. This is an additional argument for better trained decision makers in antitrust cases. Some might argue that this is also an argument for the inquisitorial procedure to prevent the rent-seeking associated with the possibility of abusing rhetoric. It is, however, hard to be confident that this would be a good solution. As follows from above, an inquisitor is also subject to imperfections and is likely to abuse rhetoric to obtain a desirable result. An example is the *Tetra/Laval* case mentioned above, where the European Commission went far in manipulating the economic analysis to achieve desirable results. One of the main roles of the parties in an adversarial procedure is to reveal and refute fallacies and flaws in the opponent's arguments. Although parties can perform some of the same function during the contradiction, this will not be the same as an adversarial procedure on equal terms with an external decision maker. Furthermore, limits in the judicial review give the inquisitor a margin to pursue desirable inferences. Thus, mitigating the risk of abuse of rhetoric is a poor argument for an inquisitorial procedure.

6.5 Conclusions

The research questions stated at the beginning of this chapter were: *How should economic models be rationally assessed in antitrust analysis? Do the antitrust assessment principles and procedures applied in antitrust analysis facilitate a rational assessment of economic models? How can the rationality in the assessment of economic models in antitrust analysis be improved?* These questions will now be addressed in turn.

How should economic models be rationally assessed in antitrust analysis?

This chapter started by giving a description of what models are. Models are assumptions on the structural links between phenomena and events, including assumptions on causality. Models are often simplifications or idealizations of reality to single out some circumstances to study. Models can have an instrumental purpose, where the only role of the model is to provide predictions to improve the decisions. However, models can also pursue realism by explaining reality, which improves a decision maker's ability to make a decision on the basis of the correct facts. In antitrust, models are used both to explain evidence and as an instrument to predict the effects of some action. Models can be purely theoretical abstractions, or the parameters of the models can be more or less fitted or calibrated with relevant data.

A model is something that improves the decision by having informative value. Models reduce the uncertainty of not knowing the truth. Models allow us to explain evidence better

than by not having any model, or to perform predictions that are better than by not having any model. Models provide explanations and predictions, and their informative value is about their ability to do so accurately.

Rationality in model-based inferences means that the uncertainty associated with the model-based inference is rationally taken into account. Model-based inferences should be adjusted for the probability of the model. Often, there are many competing models, and the competing models should be given weight according to their probability. This means that if there, for instance, are two competing models that are used to aid a decision of antitrust violation, the probability of the two models should be taken into account in the loss minimization decision.

There are both qualitative and quantitative methods that can be used to determine the informative value of models. Besides the models' ability to explain and predict observations, parsimony in variables and robustness are criteria in determining the informative of a model.

Do the antitrust assessment principles and procedures applied in antitrust analysis facilitate a rational assessment of economic models?

In antitrust, the models used for inference is generated by the legal procedure. The decision maker decides the weight to give the economic models generated by the procedure as a part of an overall assessment of evidence that also includes other evidence, such as assessing the credibility of non-expert witness statements and analyzing the validity of documents.

There are many factors that bias the model generation both in the inquisitorial procedure associated with the EU and in the adversarial procedure associated with the US. Case-based experiences and theory seem to indicate that the prosecutorial bias affects the model generation in the EU inquisitorial system. This prosecutorial bias seems, however, to have been partially mitigated by procedural reforms and some reversals due to judicial review over the last years. Since the judicial review is restricted only when it comes to complex economic evidence, some degree of sophistication is required in the intentional pursuit of prosecutorial bias. The generation of economic models to argue for desirable inferences in the case in question is an opportunity to do exactly so.

In the US, the model generation is strongly influenced by the fact that models as a main rule are generated by expert witnesses appointed by the parties. This is likely to generate biased models that favor the party that present the model. Two biased models are likely to have less informative value together than one neutral model that incorporates the information in the two biased models.

A way to mitigate the bias following from the use of party-appointed expert witnesses is the use of neutral experts. The use of neutral experts has been endorsed by leading antitrust scholars. There are, however, several problems associated with neutral experts as well. The absence of selection biases and incentive biases associated with the party-appointed experts does not mean that the neutral expert is not subject to any biases. The expert is likely to be subject to professional biases. Furthermore, it can be questioned whether the award mechanism aligns the neutral expert's incentives with the incentives required for rational generation of models. The neutral experts are subject to incentives that may not coincide with the incentives necessary to generate the right models. It can also be questioned whether experts' biases will have greater impact if experts are neutral, because the decision maker will be less critical to the expert opinion under the belief that neutrality also means to not be biased.

To reduce the impact of biased expert witnesses, it has also been suggested to increase the disclosure requirement by requiring the parties to reveal what experts that have been contacted in the process of finding an expert witness. However, too much disclosure of pre-litigation activities is a dangerous path, as one risks losing some of the benefits associated with the attorney-client privilege. Furthermore, this might make the impact of selection bias even stronger as it becomes more important for the parties to attract the right expert in the first place. It has also been suggested to impose a requirement to have a system of public disclosure of all the former statements of an expert to facilitate consistency in the experts' statements. This might reduce some of the incentive bias, but not the selection bias. One could argue that such a requirement could increase the impact of the selection bias as it will be easier to find an expert with the correct bias.

All in all, the discussion showed that it is difficult to safeguard against biases in the generation of economic models in antitrust procedure. Thus, it is important to have mechanisms that facilitate a correct assessment of the informative value of models. If the decision makers are able to correctly assess the informative value of models, it will be hard times for those who want to present biased models associated with low information value.

This chapter included an assessment on whether models are likely to be assessed according to their informative value in antitrust analysis. It was found that in the inquisitorial procedure the prosecutorial bias is likely to affect the assessment of the informative value of models. The judicial review and mechanisms of contradiction will, however, impose some constraints on the inquisitor's ability implement the prosecutorial bias. Nevertheless, when it

comes to the intentional implementation of the prosecutorial bias, abuse rhetoric can be used to implement the prosecutorial bias, in particular if this is done within topics that are subject to restricted judicial review.

In the adversarial procedure, there are many imperfections that are likely to distort the rational assessment of the informative value of models. As making the inferences from complex economic models requires effort, decision makers are likely to give more weight to simpler models that are easier to understand. This is an argument for better trained decision makers, as the assessment of complex economic models requires less effort the more trained a person is in assessing such models. However, the decision maker should not be so well trained that he is an expert himself in the field, as he then may be subject to professional biases. Furthermore, the inferences from economic models are parts of a holistic body of evidence, including other evidence such as non-expert witness statements and documents. An economics or econometrics expert is not likely to have any advantage in analyzing these kinds of evidence. Cognitive biases are also likely to disturb the correct assessment of the informative value of models in an adversarial procedure. This can be exploited by the parties by abuse of rhetoric. The adversarial process can be argued to be an ideal playground for abuse of rhetoric, which, in particular, is likely to be exploited by the party with the highest stakes. Leading antitrust scholars have even pointed out that rhetorical skills are likely to trump over professional merits in the presentation of expert testimony.

In this chapter it was also discussed how rhetoric can be abused in the argumentation for model-based inferences in antitrust analysis. It was found that argumentation for inferences based on economic models provides playing field for the abuse of rhetoric. The parties can exploit the use of assumptions that underpins the economic analysis in their arguments. The parties can exploit models to create desirable cognitive biases. Furthermore, the parties may abuse rhetoric in the argumentation associated with statistical methods, in particular, the conventional methods of significance testing, to confuse the decision makers. In an adversarial procedure, the role of the competition between parties is to reveal and refute fallacies and flaws in each other's argumentation. There might, however, be failures that limit the other party's ability to do so. If the stakes are asymmetric, one party might find it profitable to overwhelm the other party with expert evidence that the other party does not find profitable to try to refute. Below follows some suggestions to mitigate the abuse of rhetoric.

How can the rationality in the assessment of economic models in antitrust analysis be improved?

This chapter has presented various suggestions to improve the rationality in the assessment of economic models in antitrust analysis. A first obvious recommendation is for the decision makers to adhere to the principles of rationality in determining the informative value of models as described in this chapter. Both qualitative and quantitative principles of assessing the informative value of economic models were provided in this chapter. Some basic training of decision makers, not necessarily in economics, but in philosophy of science and the fundamentals of statistical inference, would probably be useful for decision makers who want to improve their performance in the assessment of the informative value of economic models and scientific evidence in general.

However, it is not very realistic to believe that general decision makers can be sufficiently trained to fully assess the informative value of complex models used in antitrust analysis. Furthermore, to use decision makers that have this knowledge would introduce other problems. Decision makers that are experts themselves are likely to be subject to professional bias. Furthermore, experts in assessing economic models do not necessarily have any advantage in assessing other evidence, such as non-expert witness statements, documents' validity and other types of evidence that are crucial in the assessment of antitrust evidence. Thus, although there is a case for better trained decision makers in antitrust analysis, this does not mean that the decision makers should be experts in antitrust economics and econometrics.

Argumentation based on inferences from economic models is a playing field for abuse of rhetoric. All elements necessary for establishing logically valid arguments could potentially be violated in arguing for model-based inferences. This is an additional argument for better trained decision makers in antitrust cases. Some might argue that this is also an argument for the inquisitorial procedure to prevent the rent-seeking associated with the possibility of abusing rhetoric. This is not likely to be a good solution. As follows from the discussion in this chapter, an inquisitor is also subject to biases and is also likely to abuse rhetoric to obtain a desirable result. One of the main roles of the parties in an adversarial procedure is to reveal and refute fallacies and flaws in the opponent's arguments. Although parties can perform some of the same function during the contradiction, in an inquisitorial procedure this will not be the same as in an adversarial procedure, where the parties are on equal terms and where the decision maker is external to the case. Furthermore, limits in the judicial review give the

inquisitor a margin to pursue desirable inferences. Thus, the risk of abuse of rhetoric is a poor argument for an inquisitorial procedure.

The question that remains, then, is what improvements can be made in the adversarial procedure to improve the ability of the competition of the parties to yield a rational assessment of the economic models. Leading antitrust scholars have suggested the involvement of neutral experts. This chapter presented some counterarguments to the superiority of the performance of neutral experts. In line with the suggestions of other commentators, the neutral experts' role should be limited to assess the evidence presented by the parties. The neutral experts may point at fallacies in the argumentation of the parties and may try to generate some of the additional informative value that follows from incorporating two biased models into one model. The neutral expert may also be useful in determining which of the parties should benefit from a presumption and thus encouraging the party that does not benefit from a presumption to clarify issues. The report of the neutral expert could beneficially be provided after the presentation of economic expert evidence by the parties. This report should be subject to contradiction by the parties. In line with the recommendation in Chapter Five of this study, decision makers should be required to provide written grounds on the evidence assessment. Then, it can be monitored as to whether the decision makers have assessed the report of the neutral expert properly, including taking the arguments generated by the contradiction into account. Furthermore, as also pointed out in Chapter Five, measures to balance the stakes of the parties would probably be beneficial. Then, each party has balanced incentives in finding the fallacies and flaws in each other's arguments.

7 Conclusions

In the introduction to this study some superior research questions were asked: *What is a rational antitrust analysis? Do the assessment principles and procedures applied in antitrust analysis facilitate rational antitrust decisions? How can the assessment principles and procedures applied in antitrust analysis be made more rational?* This chapter will address each of these questions in turn. The chapter will be concluded with some final comments.

What is a rational antitrust analysis?

Chapter Three established what antitrust analysis is. It is the determination of antitrust rules and the assessment of evidence in antitrust cases. After this, it was established what a rational antitrust analysis is. For antitrust analysis to be rational, it must satisfy the axioms of rationality established in modern decision theory. Then, the resulting decision will be rational. Adhering to the basic axioms of rationality is equivalent to maximizing expected utility of antitrust decisions, which again is equivalent to minimizing expected loss.

The axioms of rationality impose quite strong assumptions regarding the presence of precise probabilities. It was briefly explored whether alternative theories of rational decisions that do not impose such assumptions provide better normative guidance on rational decisions, but it was not found that they do so at the moment. There is potential, however, for alternative decision theories to be applied when they become more operational for legal analysis. Despite the lack of the presence of precise probabilities, a decision theory based on such presence may serve as normative guidance. The assessment principles and procedures can ideally be designed in such a way that the resulting decisions are as if exact probabilities were present.

Furthermore, Chapter Three addressed whether there is some objective standard of rational antitrust analysis as both the probability assessments and the utilities involved may be of a subjective character. It was found that by using objective methods in assessing evidence and using economic welfare as a utility measure, we come close to an objective standard for rational antitrust analysis.

Chapter Three also addressed the question of whether rationality can and should guide antitrust analysis. It was argued that it can. The lack of knowledge of precise probabilities does not prohibit antitrust analysis from being rational. As just mentioned, assessment principles and procedures can facilitate rational decisions based on such knowledge of exact probabilities, even if no one actually knows these probabilities. Furthermore, it is possible to use objective measures of probabilities and utilities to approach an objective standard for

rational antitrust decisions. It was also found that there is nothing intrinsic in the legal framework that the antitrust analysis is performed within that prohibits antitrust analysis from being rational. The wide and general antitrust statutes combined with economic welfare as one of the major purposes of antitrust law, provide a good substantive legal framework for rational analyses. The challenge is to establish assessment principles and procedures that facilitate rational analyses.

The question of whether rationality should guide antitrust analysis this was also answered in the affirmative. Rational antitrust analyses will maximize the expected economic welfare from antitrust decisions, and, in the long run, maximize the economic welfare from having antitrust laws. Furthermore rationality promotes a system of coherent and consistent antitrust rules. Finally, it might be argued that rational decisions are more predictable and thus increase legal certainty.

Chapter Five offered more precise directions for how antitrust evidence should be rationally assessed. The chapter started by citing Beckner and Salop (1999) who stated that “[t]he court first should gather information that is least expensive, resolves the most uncertainty, and is most likely to affect its decision”. A model of rational evidence assessment was developed to give more content to this statement. Rational evidence assessment is about minimizing the sum of the expected loss of errors from making a wrong decision and the cost associated with gathering evidence.

A piece of evidence should be gathered if its decision value exceeds the cost of gathering the evidence. The decision value of evidence is the evidence’s ability to reduce the expected loss from errors. There will only be a decision value from gathering some evidence if there is a chance that the outcome of the evidence gathering makes it rational to change the decision. In other words, gathering evidence only has decision value if there is any chance that gathering the evidence will influence the decision. The decision value of evidence depends on the probative force of evidence and the losses from errors. The probative force of evidence is the extent to which the evidence influences the probability of a hypothesis. In rational evidence assessment, the laws of probability determine the probative force. The higher the chance gathering evidence will have as an outcome that we with strong probative force are right in changing our decision to a decision associated with a less expected error, the higher is the decision value.

The costs of gathering evidence should be as low as possible. This means that evidence should be gathered by the one who can gather it at the lowest costs. This can be

implemented by the use of presumptions that disfavor the low cost producer. This gives the party who has the lowest cost in producing the evidence the incentive to produce the evidence.

Evidence should be gathered in the right amount and in the right sequence. A tradeoff between decision value and cost facilitates the gathering of a right amount of evidence. By gathering evidence in the right sequence, a rational decision can be taken at each stage. One can then rationally decide whether it is efficient to gather more evidence or to decide upon the evidence already available. The rational sequence of evidence gathering depends on both decision value and costs. The cheapest evidence with the highest decision value should be gathered first. However, dynamical programming is necessary to determine the right sequence of gathering evidence.

Chapter Six explicitly incorporated the rational use of economic models in antitrust analysis, with a particular focus on evidence assessment. Models are assumptions on the structural links between phenomena and events, including assumptions on causality. Models are often simplifications or idealizations of reality, made to single out some circumstances to study. Models can have an instrumental purpose, where the only role of the model is to provide better predictions to improve the decisions. However, models can also pursue realism by explaining reality to improve a decision's basis in the correct facts. In antitrust, evidence assessment models are used both to explain evidence and as an instrument to predict the future effects of some action. Models can be purely theoretical abstractions or the parameters of a model can be more or less fitted or calibrated with relevant data.

A model is something that improves the decision by having informative value. Models reduce the uncertainty of not knowing the truth. Models allow us to explain evidence better than by not having any model, or to perform predictions that are better than by not having any model. Models can provide more or less good explanations and predictions, and their informative value is about their ability to do so accurately.

Rational inference from models means that the uncertainty associated with a model-based inference is rationally taken into account. Model-based inferences should be adjusted for the probability of the model. Often, there are many competing models and the competing models should rationally be given weight according to their probability. For instance, this means that if there are two competing models that are used to aid a decision of violation, the probability of the two models should be taken into account in the loss minimization decision.

There are both qualitative and quantitative methods that can be used to determine the informative value of models. Besides the models ability to explain and predict observations, parsimony in variables and robustness are criteria that are awarded in determining the informative of a model.

Do the assessment principles and procedures applied in antitrust analysis facilitate rational antitrust decisions?

Chapter Four discussed rationality in the determination of antitrust rules. In the discussion of rationality in the determination of antitrust rules, it was analyzed how to rationally choose between rules and standards how to rationally choose the precision level of rules. It was found that the assessment principle in both the US and EU seems to have converged on presumption rules, which means that all conduct is assessed according to a standard. Presumption rules generate some of the benefits of rules, though, by mitigating the need to perform a full analysis in each case. A question then becomes how precise these presumption rules should be.

The confidence in anticompetitive effects is used to determine the presumption rules in both the US and EU. The more confidence in the anticompetitive effects in the case in question, the less is the need for an inquiry of the actual circumstances of the case. In other words the higher the a priori probability of anticompetitive effects, the less is the need for case-specific evidence to confirm this a priori assessment. At a superior level, probability of errors, error costs, costs of formulation, and costs of application should all be taken into account in determining the rules. This requires a broader assessment than just assessing the likely anticompetitive effects of the conduct in question. Thus, antitrust decision makers should take more criteria into account when they determine the rules. Because the criteria used to determine rules seems to be too narrow both in the US and EU, it cannot be concluded that the presumption rules are likely to be rational.

A potential indicator of the irrationality of antitrust rules might be the divergence of certain presumption rules used in the US and EU. The argument would be that if US and EU use different rules, they cannot be rational at the same time. This would be a too hasty a conclusion, though. The procedural frameworks in the US and EU are different, and the different benefits and costs of various rules may not be equal in the two systems. Still, taking into account that the confidence of the anticompetitive effects is the criterion used in the determination of presumption rules in both systems makes it peculiar that the presumption

rules are as different as they are. The differences are likely to be explained by other factors, such as the organization of the procedure and the incentives of the parties involved

In Chapter Four, it was also discussed whether we are likely to observe an evolution towards rational antitrust rules. This involved analyzing two aspects relevant for such evolution. The first aspect was whether the principle of precedence is an obstacle to the evolution of rational antitrust rules. One potential obstacle associated with the principle of precedence is path-dependence. The principle of precedence seems to facilitate a selection of cases that reinforce strong precedence-based rules but do not phase out weak precedents. To avoid, this there should be mechanisms providing litigators with incentives to challenge weak precedence based rules. It was shown in Chapter Four that, in the US, the private stakes resulting from the benefits of some irrational precedence-based rule may almost paradoxically contribute to the abandoning of such a rule. If, for instance, a precedence-based rule is likely to be weak due to new understanding and knowledge, the private interest associated with such a rule may provide the courts with cases that give the courts a chance to abandon that rule. If, for instance, some private party has an interest in litigating for the private benefits associated with a per se prohibition of minimum resale price maintenance, this gives the court the chance to abandon such a rule if it is not justified anymore due to new economic understanding. This is one of the benefits following from the important role of private enforcement in the US. If there was no such private enforcement, the courts in the US may not have got the chance to abandon, for instance, the per se prohibition of minimum resale price maintenance. In EU competition law, which relies more heavily on public enforcement, the correction of undesirable precedence-based rules is less likely. If the European Commission does not see the merits of enforcing a rule, the precedence will be there until it becomes so old that this as such is enough for the rule to be considered abandoned. To avoid undesirable path-dependence, there should be some correction mechanisms. Private enforcement is one such mechanism. The enforcement authorities may also, as a matter of principle, challenge rules likely to be abandoned in courts, to check if courts actually are ready to abandon the rules.

Analogical reasoning is used to complement the principle of precedence as no cases are identical. Analogical reasoning constitutes a possible obstacle to the evolution of rational antitrust rules. Using analogical reasoning and not properly taking into account the relevant circumstances may yield rules that are not rational. An antitrust rule derived by analogy from another antitrust rule should always be checked against the underlying antitrust standard and purpose to check if the analogy-based rule actually has merits according to the underlying

antitrust standard and purpose. Thus analogies can serve as a start in deriving a rule, but not as an end. It was shown in Chapter Four that a problem of using analogies might particularly arise if the analogy is based on a rule where the purpose is unclear. If the purpose of some antitrust rule is ambiguous, then how can we know if an analogy derived from the same rule is rational? By analogical reasoning, a non-meritorious rule can expand to cover more and more practices, thereby creating more and more harm. The risk of such expansion can be considered as higher in the EU than in the US as the amount of rules not serving any clear purpose can be argued to be higher in EU. Thus, a recommendation is for antitrust decision makers to be careful in the application of analogical reasoning and in accepting analogy-based argument presented by the parties. As just stated, analogy should be the start and not the end in determining an antitrust rule. This means that antitrust decision makers should always complement analogical reasoning with the underlying antitrust standard. Furthermore, analogies should not be derived from rules that themselves have no merits according to the antitrust standard.

A last point addressed related to the principle of precedence was the point that precedence-based rules can more or less intentionally contribute to the circumvention of the standard of proof. As more and more practices are considered or presumed anticompetitive as a matter of rule, there is a risk that the uncertainty associated with the anticompetitive effects is not properly addressed when the rule is applied. By this argument, the antitrust rules can expand into condemning practices not very likely to be anticompetitive. Antitrust decision makers should be careful in deciding a case on the basis of presumption rules without properly taking into account the uncertainty associated with the presumptions as such.

The second aspect analyzed associated with the evolution of antitrust rules was the impact of institutional factors and the incentives of the decision makers on the evolution of rules. It was found that rent-seeking and utility maximizing behavior of the decision-makers are likely to bias the evolution of rules away from rationality. The decision-makers will maximize their own net utility subject to the incentives provided them by their principals and the system. According to the efficiency hypothesis, the adversarial system with independent courts facilitates efficient rules. Some theories even predict that this evolution of efficient rules in the adversarial system is robust to the preferences of the judges. The interest group theory predicts that politically supervised inquisitorial enforcement authorities are likely to be influenced and biased by interest group influence in their determination of rules. In addition to this, the decisions are likely to be biased by the preferences of the utility maximizing

bureaucrats. Thus, according to these theories we should expect more rational rules in the US which mainly follows an adversarial system, while the rules in EU competition law enforcement should be biased both due to interest group influence and bureaucratic behavior resulting from the inquisitorial character of the EU procedure.

However, other theories predict a superiority of the inquisitorial system relative to the adversarial system in facilitating efficient rules. The argument is that the inquisitorial decision makers are likely to pursue the truth in a cost efficient way in the decision making, while rent-seekers have the opportunity to spend almost unlimited resources on deceptive argumentation in an adversarial court. Without deciding which theory is most likely to apply, it was concluded that rent-seeking and decision maker incentives are likely to disturb the rationality of rules in both the inquisitorial and adversarial system. Avoiding the influence of rent-seeking and biased incentives in the determination of rules is partially a question of promoting rationality in evidence assessment to prevent the evolution of precedence based on epistemologically wrong decisions.

Chapter Five analyzed the rationality of evidence assessment in antitrust. It was found that antitrust decision makers are not likely to formally use probability theory and expected loss minimization in their overall assessment of evidence. Rather, the overall assessment of antitrust evidence can better be described as abductive reasoning, where the one that assesses evidence holistically searches for plausible explanations of the evidence to ultimately find a best explanation. Abductive reasoning includes the use of informal methods such as presumptions, analogical reasoning, and appeal to expert knowledge. All these elements are crucial to actual evidence assessment in both the US and EU. Presumptions are an important instrument in antitrust evidence assessment. Antitrust decision makers regularly use analogy by referring to evidence assessments in previous decisions. Expert knowledge, in particular economic expert knowledge, has a crucial role in informing antitrust decisions.

It has been argued in the literature that abductive reasoning as a starting point gives the correct evidence assessment. The question is whether there are imperfections and biases that distort the evidence assessment away from being correct. It was found that there are several sources of imperfections and biases that are likely to distort antitrust evidence assessment. The decision makers are maximizers of utility subject to institutional incentives, the decision makers can be influenced by cognitive biases, there is a risk of errors associated with the use of analogies, experts might be biased, and rhetoric can be abused by the parties in the argumentation. The impact of these imperfections and biases is likely to be dependent on

whether the procedural system is inquisitorial or adversarial. Thus, the impact of these imperfections and biases is likely to differ in EU and US.

When it comes to inquisitorial systems, empirical research and literature has suggested that an inquisitorial decision maker is subject to a prosecutorial bias that systematically favors the evidence assessment in favor of violation. Some of this literature directly addresses antitrust and, in particular, the enforcement of the European Commission. The prosecutorial bias is a result of both incentive biases and cognitive biases. As an inquisitorial enforcement authority is awarded for what it does, it is likely to be subject to an incentive bias in favor of finding violations. The inquisitor is also likely to be subject to a confirmation bias, which is a cognitive bias. According to the cognitive bias, people tend to assess evidence in a way that confirms already established beliefs, which means to confirm a belief of violation in the context of a prosecutorial bias.

By using economic modeling, it was found that the prosecutorial bias has additional consequences for the rationality of evidence assessment than the pure static effect in terms of a wrong evidence assessment. The inquisitor has an incentive to excessively search for evidence that has strong probative force supporting violation and to search too little for evidence that has probative force in contradiction of violation. In addition to the prosecutorial bias, the inquisitor has an excessive incentive to save his own cost by transferring the burden of producing evidence to the investigated parties by the use of presumptions. This will lead to inefficiency in the gathering of evidence. Combined with the confirmation bias, the inquisitor is likely to give too strong probative force to the failure of the parties to produce evidence. Thus, the incentives to reduce costs reinforce the effects of the prosecutorial bias. Since the EU competition procedure is best characterized as an inquisitorial procedure, the conclusion is that the evidence assessment in the EU competition law enforcement is likely to be systematically biased, favoring violation. Furthermore, evidence is not likely to be gathered rationally. There will be an excessive search for evidence that has probative force supporting violation. Furthermore, the cost of gathering evidence is not likely to be efficient because the Commission has an excessive incentive to impose a burden on the parties investigated to produce evidence.

When it comes to the adversarial procedure, the decision makers are not likely to be subject to systematical biases towards either finding violation or finding not violation. This does not mean that the decision maker cannot be biased, though, just that there is no reason to believe that the decision makers have some systematic preferences for violation or not

violation. The adversarial procedure is characterized by the parties (represented by lawyers) arguing for their own interest. The parties are likely to try to exploit cognitive biases and argue on the basis of analogies without merits if it benefits their case. Furthermore, since the main rule is that the parties choose their own experts to support their arguments, it is likely to be a biased selection of experts with professional preferences that support the case of the party they represent. Furthermore, even if experts are repeat players and have a reputation to maintain, it cannot be ignored that the experts will undertake efforts in satisfying their paying clients, which will bias the expert opinions away from the pure professional. The parties are also likely to abuse rhetoric in influencing the decision makers. These imperfections are likely to be exaggerated in laymen jury trials, as juries are not experienced in filtering out and correct for imperfections and biases. Thus, the evidence is likely to be noisier in an adversarial trial. The more noisy evidence the more evidence is needed for an accurate decision.

The model developed in Chapter Five and insight from other modeling efforts were used to gain further information on performance of the adversarial trial. A beneficial effect of the evidence competition in an adversarial trial is that if a party believes that the decision maker is subject to some systematic bias, he has an incentive to mitigate this by evidence production. Furthermore, if we assume that providing evidence on the side of the truth is cheaper than fabricating evidence, the party with the truth on side has a competitive advantage. Thus, these are arguments that biases, if they are present, are not as harmful in the adversarial procedure as in the inquisitorial procedure.

The adversarial process facilitates an evidence race that tends to lead to excessive evidence production. This is exaggerated by high stakes in the case. Thus, there is a potential for rent-seeking. However, if the private stakes are low compared to the social stakes, too little amount of evidence may be produced. If stakes are asymmetric, there is likely to be an imbalanced amount of evidence in favor of the party with the high stakes. Thus, if we make an assumption that we are likely to observe asymmetric stakes in cases where a defendant wants to protect its monopoly profits, then there might be a systematic bias towards findings of not violation in these cases.

There are likely to be deviations from rationality in the evidence assessment both in the inquisitorial EU system and the adversarial US system. Which system performs best depends on whether the failures of the inquisitorial or adversarial procedure are worst. However, there are arguments in favor of the adversarial system in US. Although this system

is subject to weaknesses it seems not to be subject to the same systematic bias towards finding violation as the inquisitorial system is. Furthermore, the analysis in Chapter Five revealed that the evidence costs savings normally associated with the inquisitorial procedure are not as obvious as it appears taking the biases into account. Too much evidence in favor of violation is likely to be produced in the inquisitorial system. Although the evidence is noisier in the adversarial system, the absence of systematically biased decision makers and the excessive amount of evidence is likely to, as a main rule, facilitate a more accurate decision as long as the stakes are not too asymmetric.

A particular feature of antitrust decision is the use of economic models to inform the decisions. This was discussed in Chapter Six. The models used for inference in antitrust cases are generated by the legal procedure. The decision maker decides the weight to give the economic models generated by the procedure as a part an overall assessment of evidence that also includes other evidence, such as assessing the credibility of non-expert witnesses and analyzing the content of documents.

There are many factors that bias the model generation both in the inquisitorial procedure associated with the EU and in the adversarial procedure associated with the US. Case-based experiences seem to indicate that the prosecutorial bias affects the model generation in the EU inquisitorial system. This prosecutorial bias seems, however, to have been partially mitigated by procedural reforms and some reversals after judicial review over the recent years. Since the judicial review is restricted only when it comes to complex economic evidence, some degree of sophistication is required in the intentional pursuit of prosecutorial bias. The generation of economic models to argue for desirable inferences in the case in question is an opportunity to do exactly that.

In the US, the model generation is strongly influenced by the fact that models as a main rule are generated by expert witnesses appointed by the parties. This is likely to generate biased models that favor the party that presents the model. Two biased models are likely to have less informative value taken together than one neutral model that incorporates the information in the two biased models.

A way to mitigate the bias following from expert appointed witnesses is the use of neutral experts. The use of neutral experts has been endorsed by leading antitrust scholars. There are, however, several problems associated with neutral experts as well. The absence of selection biases and incentive biases associated with the party-appointed experts does not mean that a neutral expert is not subject to any biases. The expert is likely to be subject to

professional biases. It can also be questioned whether the award mechanism aligns the neutral expert incentives with the incentives compatible with rationality in the generation of models. The neutral experts are subject to incentives that may not coincide with the incentives necessary to generate the right models. It can also be questioned whether experts biases will have greater impact if experts are neutral, because the decision maker will be less critical to the expert opinion under the belief that neutrality also means to not be biased. Neutral experts do not, however, need to replace the party experts but rather complement them. The role of a neutral expert does not need to be to generate models, but to assess the models generated by the parties and to try to rationally extract the information that lies in combining the models presented by the parties.

To reduce the impact of biased experts, it has also been suggested to increase the disclosure requirements by requiring the parties to reveal what experts have been contacted in the process of finding an expert witness. However, it can be argued that too much disclosure of pre-litigation activities is a dangerous path, as one risks losing some of the benefits associated with the attorney-client privilege. Furthermore, this may make the impact of selection bias even stronger as it becomes more important for the parties to attract the right expert in the first place. It has also been suggested to impose a requirement to have a system of public disclosure of all the former statements of an expert to facilitate consistency in the experts' statements. This might reduce some of the incentive bias, but not the selection bias. One could argue that such a requirement could make the selection bias even more influential as it will be easier to find an expert with the correct bias.

It is difficult to safeguard against biases in the generation of economic models in antitrust procedure. Thus, it is important to have mechanisms that facilitate a correct assessment of the informative value of models. If the decision makers are able to correctly assess the informative value of models, it will be hard times for those who want to present biased models associated with low information value. Chapter Six discussed whether models are likely to be assessed according to their informative value in antitrust analysis. It was found that in the inquisitorial procedure the prosecutorial bias is likely to affect the assessment of the informative value of models. The judicial review and mechanisms of contradiction will, however, impose some constraints on the inquisitor's ability implement the prosecutorial bias. However, when it comes to the intentional implementation of the prosecutorial bias, the possibility to abuse rhetoric can be used in the argumentation to implement the prosecutorial bias, especially if this is done within topics that are subject to restricted judicial review.

In the adversarial procedure, there are many imperfections that are likely to distort the rational assessment of the informative value of models. As making inferences from complex economic models requires effort, decision makers are likely to give more weight to simpler models that are easier to understand. This is an argument for better trained decision makers as the assessment of complex economic models requires less effort the more trained a person is in assessing such models. However, the decision maker should not be so well trained that he is an expert himself in the field, as he then may be subject to professional biases. Furthermore, the inferences from economic models are parts of a holistic body of evidence, including other non-expert witness statements and documents. An economics or econometrics expert is not likely to have any advantage in analyzing these kinds of evidence. Cognitive biases are also likely to disturb the correct assessment of the informative value of models in an adversarial procedure. This can be exploited by the parties in the abuse of rhetoric. The adversarial process can be argued to be an ideal playground for abuse of rhetoric, which, in particular, is likely to be exploited by the party with the highest stakes. Leading antitrust scholars have even pointed out that rhetorical skills are likely to trump over professional merits in the presentation of expert testimony.

Chapter Six included an analysis of how rhetoric can be abused in the argumentation for model-based inferences in antitrust analysis. It was found that argumentation based on inferences based on economic models provides a playing field for the abuse of rhetoric. The parties can exploit the use of assumptions that underpins the economic analysis in their arguments. The parties can exploit assumptions to create desirable cognitive biases, and the parties may abuse statistical methods, in particular, the conventional methods of significance testing, to confuse the decision makers. In an adversarial procedure, the role of the competition between parties is to reveal and refute fallacies and flaws in each other's argumentation. However, there might be failures that limit the other party's ability to do so. If the stakes are asymmetric, one party might find it profitable to overwhelm the other party with expert evidence that the other party does not find profitable to try to refute.

How can the assessment principles and procedures applied in antitrust analysis be made more rational?

In Chapter Four some suggestions were made to promote more rationality in the determination of rules. The antitrust decision makers should take more criteria into account when they determine the rules. The presumption rules in both the US and EU are determined by the confidence in the anticompetitive effects of the conduct in question. At a superior

level, probability of errors, error cost, costs of formulation, and costs of application should all be taken into account. This requires a broader assessment than just assessing the likely anticompetitive effects of the conduct in question.

To cope with the problem of path-dependence associated with the principle of precedence, a system should contain incentives for parties and enforcement authorities to try out precedence-based rules that are likely to be overturned by the courts, so that they actually can be overturned. A system of private enforcement facilitates this. Thus, the work to promote private enforcement of EU competition law should continue. Enforcement authorities, such as the European Commission, may also enforce these rules to give the rules a chance to be challenged in the courts.

To deal with the imperfection associated with the use of analogies associated with the principle of precedence, the decision makers should be careful in applying analogies as an end in legal interpretation. Analogies can be used as a source of inspiration for what a rule should be, but this suggested rule should be checked against the underlying antitrust standard and purpose. Thus, analogies should be used very carefully when they are based on rules with an ambiguous purpose.

It was also identified a risk of the circumvention of the standard of proof associated with the principle of precedence. To avoid that the principle of precedence is used to circumvent the standard of proof, there rests a responsibility on antitrust decision makers to not uncritically turn facts from previous cases into a precedence-based rule. The probative force of a presumption rule as such should be taken properly into account in the question of whether the presumption rule is rebutted.

It is more difficult to provide good suggestions as to how avoid biases on rules from interest group influence and personal preferences of the antitrust decision makers. However, a crucial element of avoiding such biases is to promote rationality in evidence assessment which will prevent the evolution of precedence based on epistemologically wrong decisions.

Measures to improve the rationality in assessment of evidence were addressed in Chapter Five. There is a sliding scale between the adversarial system and the inquisitorial system. The inquisitorial systems can be improved with adversarial elements by extending contradictory rights, including formal hearings, internal peer review, and by strengthening the judicial review. This is descriptive for the evolution of the EU competition procedure, as described in this study. On the other hand the adversarial system can be made more “inquisitorial” by giving the judge a more active role in the evidence administration and by

giving the judge more opportunities to take initiatives *ex officio*. By this, we can obtain an optimal mix of adversarial and inquisitorial elements.

Based on the incentive structure, an improvement of the adversarial system seems to be the most promising starting point for antitrust procedures that better facilitate rational decisions. Even if the inquisitorial procedure is improved by introducing instruments such as more extensive contradictory rights, better peer review mechanisms, and strengthened judicial review, this will not fully solve the intrinsic problems associated with the incentive structure. An inquisitorial enforcement authority is there to find violations, and its performance in doing so will govern the incentives in evidence assessment. Judicial review will discipline the inquisitorial decision makers, but the investigated party will be subject to an inequality of arms when it has the burden to prove that the decision is wrong. In this operation, the investigated party will have to battle an excessive amount of evidence favoring violation while evidence contradictory to violation is not properly explored.

In an adversarial system, it is not the incentives of the decision makers that are the main problem, but the failures associated with the evidence production of the parties and the risk of assessment failures due to the exploitation of imperfections and biases in the assessment of evidence. By extending the role of judges in demanding from parties clear statements on what inferences are supposed to be drawn from some evidence presented for evidence to be admissible, and by training the decision makers in handling possible assessment fallacies, the decision making can be improved. To facilitate this, written evidence assessments should be required, including grounds on which inferences are drawn from the various elements of evidence. This will discipline the decision makers to analytically assess every piece of evidence and the inferences made from them. Furthermore, by being able to declare evidence inadmissible on the basis of cost consideration, the judge can mitigate both the problem of excessive evidence in general and excessive evidence from one party due to asymmetric stakes. More screening from judges will, in itself, reduce the incentives for excessive production of evidence in the first place as it will be a less chance that excessive evidence will be allowed into court. The problem is, however, that the judges do not have sufficient incentives to take the costs fully into account. More evidence administration requires more personal efforts by the judge. A stricter requirement of written evidence assessment may help also to mitigate this problem. After all, more evidence will extend the decision that has to be written, which also involves effort. Furthermore, it will force the judge to incur the effort to assess the evidence. This will give the judge a stronger incentive in the

evidence administration to weigh the benefits of additional evidence against the costs. Other procedural rules, such that rules that increase the costs of providing excessive evidence and to balance the stakes in a trial, may mitigate some of the problems associated with an adversarial procedure. Rules such as treble damages increase the stakes for the plaintiffs relative to defendants, which can balance some of the asymmetric stakes due to monopoly rent protection. However, such rules must be used carefully to balance the asymmetries of the stakes and not to exaggerate the asymmetries.

Thus, the conclusion is that there is room for improvements that better facilitate rational evidence assessment. An adversarial procedure supplemented by some “inquisitorial” elements seem to be the best starting point for better evidence assessments, rather than an inquisitorial procedure supplemented with “adversarial” elements. This conclusion seems to correspond with contemporary research in law and economics.

In Chapter Six several suggestions to improve the rationality in the assessment of economic models in antitrust analysis were presented. A first obvious recommendation is for the decision makers to adhere to the principles of rationality in determining the informative value of models. Both qualitative and quantitative principles of assessing the informative value of economic models were given in Chapter Six. Some basic training of decision makers, not necessarily in economics, but in philosophy of science and the fundamentals of statistical inference, would probably be useful for decision makers who want to improve their performance in the assessment of the informative value of economic models and scientific evidence in general. However, it not very realistic to believe that general decision makers can be sufficiently trained to fully assess the informative value of complex models used in antitrust analysis. Furthermore, to use decision makers that have this knowledge would introduce other problems. Decision makers that are experts themselves are likely to be subject to professional bias. Furthermore, experts in assessing economic models do not necessarily have any advantage in assessing other non-expert witness statements, documents’ validity, or other aspects that are crucial in the assessment of antitrust evidence. Thus, although there is a case for better trained decision makers in antitrust analysis, this does not mean that the decision makers should be experts in antitrust economics and econometrics.

The court is a playing field for abuse of rhetoric in argumentation based on inferences from economic models. All elements necessary to establish logically valid arguments could potentially be violated in arguing for model-based inferences. This is an additional argument for better trained decision makers in antitrust cases. Some might argue that this is also an

argument for the inquisitorial procedure to prevent the rent-seeking associated with the possibility of abusing rhetoric. It is not likely that this would be a good solution. As follows from the analysis in Chapter Six, an inquisitor is also subject to biases and is also likely to abuse rhetoric to obtain a desirable result. One of the main roles of the parties in an adversarial procedure is to reveal and refute fallacies and flaws in the opponent's arguments. Although parties can perform some of the same functions during the contradiction in an inquisitorial procedure this will not be the same as in an adversarial procedure, where the parties are on equal terms and where the decision maker is external to the case. Furthermore, limits in the standard of judicial review give the inquisitor a margin to pursue desirable inferences. Thus, the risk of abuse of rhetoric is a poor argument for an inquisitorial procedure.

A question is what improvements that can be done in the adversarial procedure to improve the ability of the competition of the parties to yield a rational assessment of the economic models. Leading antitrust scholars have suggested the involvement of neutral experts. Some counterarguments to the superiority of the performance of neutral experts were presented in Chapter Six as described above. In line with the suggestions of other commentators it is desirable that neutral experts' role should be limited to assess the evidence presented by the parties and their experts. The neutral experts may point at fallacies and flaws in the argumentation of the parties and may try to generate some of the additional informative value that follows from incorporating two or more biased models into one model. The neutral expert may also be useful in determining which of the parties should benefit from a presumption and thus encouraging the party that does not benefit from a presumption to clarify issues. The report of the neutral expert could beneficially be provided after the presentation of the economic expert opinions of the parties. Furthermore, the report of the neutral expert should be subject to contradiction by the parties. In line with the recommendation in Chapter Five, decision makers should be required to provide written grounds on the evidence assessment. Then, it can be monitored if the decision makers have assessed the expert report of the neutral expert properly, including taking the results of the contradiction into account. Furthermore, as was also pointed out as a general measure in Chapter Five, measures to balance the stakes of the parties would probably be beneficial. Then each party has balanced incentives in finding the fallacies and flaws in the other's expert opinions.

Some final comments

Rationality in the application of antitrust law has been subjective to extensive research. Seminal contributions in antitrust law and economics have contributed to deeper understanding of rationality in antitrust analysis. The research has covered legislative and interpretative issues on the determination of antitrust law, where issues such as rules versus standards and the optimal precision of rules are central issues. Furthermore, the scientific approach to rational assessment of evidence has been studied in the context of antitrust analysis, including methods of systematically weighting the probative force and decision value of evidence against the cost of gathering evidence. Research has also been informative as to how to improve the procedure to facilitate a rational antitrust analysis. This study is a contribution to this research.

The scarce statutory precision of antitrust laws forms the basis for a pragmatic consequence-oriented interpretation and application of antitrust rules. This is an almost ideal legal framework to promote rationality. Decision theory and rationality has, indeed, guided the evolution of rules and utilization of presumptions in the application of the law. This is illustrated by the *Leegin* case in the US. Research on the rational tradeoff between the information value of evidence and the cost of gathering evidence has provided guidance for enforcement authorities and courts. Procedural reforms and practices have been informed by law and economics research. The use of economic models to guide inferences in antitrust analysis has been improved as the reflective level on the informative value of economic models has increased. Trial and failure on quantitative techniques in actual cases has corrected overoptimistic views on the evidentiary potential of costly advanced quantitative methods.

Nevertheless, antitrust analysis can be made more rational. We still find areas where the antitrust rule applied might not appear as a very rational rule, where irrelevant factors, rather than decision value and costs, guide the evidence gathering where the assessment of evidence is not very much in correspondence with the information content of the evidence, and where there is not much reflection on the information value on the models relied on for inferences. Hopefully this study can contribute to the promotion of more rationality in antitrust analysis.

The debate between rule and standards is in no way settled. The appropriate use of presumptions in antitrust rules is briskly debated. There are on-going debates as to what evidence provides most information value and is most cost-efficient in assessing antitrust

issues, such as what the decision value of market shares in antitrust analysis is and if information exchange is pro-competitive or anti-competitive. It is debated which economic models that are most informative and how economic expertise should be incorporated in the procedure. The appropriate standard of proof in antitrust cases is a debated issue. The organization of procedure is also a hot topic. Many favor the US adversarial system, while others defend the inquisitorial system in Europe, at least if it is modified. Some topics addressed by this study have still not been scrutinized properly in an antitrust context. In areas that have been subject to research, there is still a long way to go for this research to be implemented in the practical application of antitrust law. This study has hopefully provided valuable insights to these debates and many other contemporary debates.

The inquiry into the rationality of antitrust analysis in this study has come to an end. The differences between the inquisitorial EU system and US adversarial system, and the cases produced by the two systems, have provided this study with a natural experiment. The cases generated in these two systems together with theoretical research, have been informative in reaching conclusions on the rationality of antitrust assessment principles and procedures. Still, it appears that this study has only been able to address the tip of iceberg. An almost unlimited amount of cases already decided and to come in the future will inform the topic further. In addition, ongoing theoretical research is also likely to inform the topic further. Although the conclusions in this study are supported by reasons, this study also contains a range of testable hypotheses that could benefit from further testing. This provides the author with an inspiration for future research, which, hopefully, also applies to the readers of this study.

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